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ACROSS AUSTRALIA

VOL. I

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TORONTO

ACROSS AUSTRALIA

BY

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VOL. I

WITH ILLUSTRATIONS AND MAPS

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ACROSS AUSTRALIA

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CHAPTER I

INTRODUCTION

It is exactly fifty years since McDouall Stuart first crossed Australia. Could he now revisit the scene of his explorations he would find the Central country, save for the telegraph line with its isolated stations, practically unchanged. He might, at long intervals, come across a hut forming the home of one or two white men managing an outlying cattle-run. In the heart of the Macdonnell Ranges he would find a minute township called after himself, and away to the east of his track, he would hear of the existence of a mere handful of miners, the relics of a gold rush, on the Arltunga field. Otherwise he would find the vast centre of the continent as wild and empty as it was when first he toiled across.

In 1872, the opening of the telegraph line—the building of which was gallantly undertaken, single handed, by South Australia—marked a very distinct stage in the history, not only of that State, but of Australia. The route followed was practically that of McDouall Stuart, and for thirty years it formed Australia's only means of telegraphic communication with the outside world. Gradually the railway pushed northward from Adelaide,

first of all to Terowie, the termination of the broad-gauge line and, it may be added, the northern end of comfort, so far as railway travelling is concerned in South Australia. A little to the north of this, the Broken Hill line branches off to the north-east. The great northern line continues on its course until by steep gradients and sharp curves it creeps up and over the Flinders Range and reaches Quorn. Here the train halts for the night. The next day it starts off again, traversing the eastern side of the Lake Torrens basin and keeping close to the base of the Flinders Range, with its line of sharply serrated, picturesque hills, bare of vegetation from base to summit. Once more it rises amongst the hills, which here sweep round from east to west; and then, at Leigh's Creek, it descends abruptly and enters the Lake Eyre basin. From an elevation of nearly 1300 feet on the summit of the watershed between Lake Torrens and Lake Eyre, the line gradually descends until at Hergott Springs, the next stopping-place for the night, the height above sea level is only 155 feet. Further on, at Stuart Creek, it is actually twenty-five feet below sea level, the lake being fourteen feet lower still. Gradually the land rises until at Oodnadatta, nearly 700 miles north of Adelaide, the railway ends far out in the wilds. From Adelaide to Quorn there is a daily train, from Quorn to Hergott one every week, and from Hergott to Oodnadatta one every fortnight—a fair indication of the relative loneliness of these far-away spots. From Oodnadatta you travel as best you can across the 1063 miles that lie between it and Pine Creek, the termination of the short line, only 150 miles in length, which runs south from Darwin.

It is with the inland or true central part of the continent, lying between Lake Eyre in the south and the western

shores of the Gulf of Carpentaria, that our narrative deals. The greater part of this area is known as the Northern Territory, which comprises more than 523,000 square miles; or, to express it in another way, it is two and a half times the size of France and four and a half times that of Great Britain.

The salient physiographical features of the interior are indicated on Map No. I (at end of volume), but of course only in a very general way. Fortunately they are of such a nature and on such a scale that they can be represented more or less easily and simply. Apart from the coastal districts and exclusive of Western Australia, there are three great areas of river drainage, occupying almost the whole of the interior and eastern parts of the continent. Each of them runs in a general north-east to south-west direction. The most southern of the three is the Murray basin, in the centre lies the Lake Eyre, and to the north the Lake Woods basin. Of these three the two latter are inland basins with no outlet to the sea. There are also other smaller basins of inland drainage, such as those connected with Lakes Torrens, Gairdner, and Amadeus, but they are insignificant when compared with the three large ones.

The dotted lines indicate roughly the lines of watershed that separate these basins from one another and from the coastal districts. Though some of the Ranges and high lands, forming the watershed of the Lake Eyre basin, are far away from the central area, yet they are intimately associated with it, because along them lies the area of intake for a large part of the supply of water that is tapped by the artesian wells of the interior.

It will be seen that a line drawn direct from Sydney to the mouth of the Victoria River on Cambridge Gulf passes across the centre of each basin.

Summarising very briefly the physiographic features of Central Australia and the Northern Territory, we can say that it consists of four distinct parts :—

(1) A relatively small portion in the south-west containing Lake Amadeus. This consists of true desert country across which no streams run, or only very insignificant ones, and then but for a short distance from the hills amongst which they take their rise.

(2) A south-eastern part, which forms a portion of the Lake Eyre basin and is drained by the Finke River and its tributaries. This really includes the great Central Ranges, because the line of watershed, with an elevation of nearly 3,000 feet, lies actually to the north of the main ridge from which the highest peaks of the Macdonnells rise and across which, also, the rivers run at right angles in their southward course.

(3) The Lake Woods basin to the north of the Central Ranges. This is a great saucer-like area; its southern margin, which coincides with the tropic of Capricorn, is bounded by the Macdonnell Ranges, its eastern by a continuation of these to the north-east, and its northern by the Coastal Ranges of the Gulf of Carpentaria and the Indian Ocean. Its western limits are unknown. From north to south it measures, roughly, four hundred and fifty miles. The elevation of its southern margin is a little under three thousand feet, at Barrow Creek; one hundred and forty miles further north it is one thousand seven hundred feet. At Powell Creek, two hundred and seventy miles on, it is just a thousand feet; seventy miles further north again, its lowest point, seven hundred feet, is reached, and here, in the rain season, the water accumulates in vast sheets and forms Lake Woods. To the east and north the land rises again to a height of one thousand feet on the watershed which sweeps round,

following roughly the outline of the coast and separating this great inland basin from

(4) The coastal regions.

Of these four areas the second and the third, which together occupy a large part of the Centre, may be known as the Australian Steppe lands. The Finke Basin forms the southern and the Lake Woods the northern Steppes. The Finke Basin is crossed by numerous watercourses coming down from the Ranges, and may again be divided into two parts, the Higher and the Lower Steppes, the former comprising the northern elevated plateau, and the latter the great sandstone plain laid down long ago in the inland sea which once washed up against the southern margin of the Central Ranges.

At one time or another our journeyings led us across each of these four areas, and we have combined in this account material that has really been gathered together at different times and under very varying conditions. In previous publications we have given detailed accounts of the habits, manners, and customs of the native tribes inhabiting the central and northern central parts of Australia, and of the main features in regard to the natural history of the same area.[1] Such accounts contain, of necessity, much that is purely technical and scientific and of no interest to the general reader; but in the present work we have attempted to write a simple narrative of some of the most interesting things that we have seen. The use of a certain number of technical terms is inevitable, all the more so because in Australia we are not old enough to have popular names, given by country folk and children and sanctioned by long usage, for more than

[1] *The Native Tribes of Central Australia*, 1899; *The Northern Tribes of Central Australia*, 1894; *Horn Scientific Expedition to Central Australia, Narrative, &c.*, 1896.

a few of even our most common animals and plants. Though our travels have led us across some of the wildest parts of Australia, we have no thrilling tales of adventure to tell; in fact, from this point of view, we ourselves have had nothing but the most commonplace and prosaic experiences. We have, however, seen many things that the ordinary white man does not have the chance of seeing, and some, indeed, that no white men, save ourselves, have ever seen or are likely to see, because the Australian aborigine is intensely secretive in regard to his most sacred customs and beliefs, and unless one is regarded as an initiated member of the tribe, one may live amongst them for a lifetime, as many white men have done, and yet know nothing whatever of these things.

All our information has been gathered at first hand, and all the photographs of scenery, natives, and ceremonies have been taken by ourselves. It may also be well to add that both of us are regarded as fully-initiated members of the Arunta Tribe.

It is extremely difficult to convey in words a true idea of many of the native ceremonies. Any such description is apt to give the impression of a much higher degree of civilisation or, at least, of greater elaborateness than is really the case. It must always be remembered that though the native ceremonies reveal, to a certain extent, what has been described as an "elaborate ritual," they are eminently crude and savage. They are performed by naked, howling savages, who have no permanent abodes, no clothing, no knowledge of any implements, save those fashioned out of wood, bone, or stone, no idea whatever of the cultivation of crops, or of the laying-in of a supply of food to tide over hard times, and no words for any numbers beyond three or four. Apart from the simple but often very decorative designs drawn on the bodies of

the performers, or on the ground during the performance of ceremonies, the latter are crude in the extreme, and, whilst watching the natives making preparations for them, nothing gives one a more vivid impression of their savage nature than the way in which they draw and use their own blood, smearing it over one anothers' faces and bodies as a gum with which to fix the colour down.

It must be confessed that there are wide areas in the centre of Australia where the scenery is extremely monotonous and travelling anything but pleasant. Everything is on a large scale, whether it be the boundless plains covered with meagre scrub ; the great valleys, two or three hundred miles in length, in the midst of the Ranges ; the impressive gorges that cut across the latter ; or the wide river channels, either absolutely dry or filled with floods of water. Despite its dreary scrub, its often intense heat, its seasons of drought when everything is parched and dry, its dust and plagues of flies and mosquitoes, it is, when once one has grown to know it, a fascinating country.

CHAPTER II

LAKE EYRE REGION AND THE URABUNNA TRIBE

One of the most remarkable features in the physiography of Australia is the great depression which centres in Lake Eyre, or Katitunda as the natives call it, where the level of the land is actually below that of the sea. A glance at the map of Australia will reveal the size of the area drained by rivers which, when they do run, and this may be only at long intervals, carry their waters towards Lake Eyre. In ordinary circumstances these rivers are rivers in name only. They consist of wide, sandy channels, bordered perhaps by gum trees and containing scattered waterholes which are more or less permanent. On the eastern side the Barcoo, or Cooper's Creek, and the Warburton, with their various branches, carry down great volumes of flood water from the interior of Queensland and New South Wales. On the north and west the Finke, the Macumba, and the Neale run down from the Macdonnell, the Musgrave, and other minor ranges that margin the Eyrean region in this part of the Centre.

In the accounts of the early explorers nothing is more striking than the way in which one traveller met with sterile wastes and was turned back by an entire absence of water, while another, traversing perhaps the same region,

only at a different time, met with water and grass in abundance. The simple fact is that, in the centre of Australia, everything depends upon the nature of the season, and there is no counting upon this. Not until such time as we can cause the dense clouds—which often, day after day, hang like a pall over the drought-stricken country—to discharge their contents, will the settlement of the great central area of the Continent be free from all cause of anxiety, though meanwhile much may be done by systematic storage of water and easier means of transport. Every traveller in the interior, especially in the summer months and during drought times, has been immensely impressed, as indeed he could not fail to be, with the fact that moisture was there and in abundance, only it was not available. After a spell of intensely hot weather the clouds will be seen gathering on the horizon. Slowly they overspread the sky, hanging low in great dark masses. A few large heavy drops of rain will fall, and then, just as if they had come merely to taunt the weary traveller or the settler watching his flocks dying of thirst, the clouds rise and roll away, leaving the bare country once more exposed to the scorching glare of the summer sun. In 1894, on the occasion of the Horn expedition, when we were travelling over the southern part of the Centre between Charlotte Waters and Oodnadatta, it was pitiful to see the results of the recent drought. Mile after mile of the scrub was dead. Thin and meagre though the small shrubs had been, the poor cattle had dragged themselves into such a minute amount of shade as they did afford, and there they had died. So intensely dry is the air that their skins still remained intact, covering the bones from which ants and beetles had removed every vestige of flesh. For miles in some parts of the country, which had been occupied by one of the outlying cattle-

runs, almost every little shrub sheltered, or rather threw its thin shadow over, the body of some poor beast. Every waterhole also claims its victims in time of drought. As the water recedes, the margin, trampled on by the thirsty beasts who have to go further and further in to reach the muddy fluid, becomes a quagmire in which many a weak animal sinks down never to rise again.

The basin of Lake Eyre is closely associated with the early history of exploration in South Australia, a State which, though small in population, played a great part in the attempt to open up the centre of the Continent. The names of McDouall Stuart, Sturt, Eyre, Warburton, and, in more recent years, Giles, Gosse, and Forrest, are not likely to be soon forgotten.

In the early days Eyre discovered, or thought that he did, a lake extending in the form of a great horse-shoe, the western limb of which terminated near the head of Spencer Gulf, while the eastern curved back, touching almost the western boundary of New South Wales. On old maps, of one of which the illustration (Fig. 1) is a copy, the total length of the lake from its southern to its most northern limit is represented as covering no less a space than three hundred miles. Eyre, who penetrated into the centre of the supposed horse-shoe, saw from the top of a hill this vast sheet, apparently barring his northward progress, and, thinking it to be all one continuous mass, named it Lake Torrens. As a matter of fact there was no continuous sheet of water, the supposed horse-shoe being broken by a sheet of level country across which the overland telegraph line and the railway now run. Later on, after the finding of this route, there arose some dispute amongst the explorers as to who really discovered it. Babbage, who took the field in 1858, claimed that he had done so before he was recalled and superseded by Warburton, but his claim was not allowed. Indeed, in

1859, the South Australian Government more or less formally recognised Warburton as the discoverer of a

FIG. 1.—Copy of part of an old map of Australia published in 1842 showing the supposed horseshoe-shaped Lake Torrens. This was subsequently found to consist of a chain of lakes now known respectively, from west to east, as Lakes Torrens, Eyre, Gregory, Blanche, Callabonna, and Frome. The approximate position of each of these is indicated.

route to the far north over what was supposed by Eyre to be the bed of Lake Torrens, and Babbage was dis-

credited.[1] It had, at all events, been made quite clear that there were two large lakes, one to the north and one to the south, with dry land between them. In 1860 the *South Australian Register* published an article headed "Lake Eyre," stating that both lakes had been discovered by Eyre—though he supposed them to be only one—and suggesting that, after determining which was the principal one, the name of the famous explorer should be given to it. This was the first occasion on which the name was used, and in a departmental report printed and issued by the South Australian Government on September 17th, 1860, official sanction was, for the first time, given to the name.[2]

At the present day the railway runs close to the western margin of the southern end of the lake, the exact area of which is not known. For the most part, as when we saw it first, it is simply a vast sheet of snow-white salt, glistening in the sunshine. Doubtless there may be always a certain amount of water in the centre, but this is quite invisible from the low hills and banks which border the margin. All that can be seen is a white sheet merging into a misty haze (Fig. 2). As yet no one has ever crossed the lake or sailed on its waters. Once, at least, an attempt was made, and some confiding and adventurous traveller actually set forth from Adelaide with a boat. Its keel was not, however, destined to

[1] A full account of this matter is given by the late Dr. A. W. Howitt in his Presidential Address to the Australasian Association for the Advancement of Science, Adelaide, 1907. After a most careful investigation of all the documents and evidence, Dr. Howitt has clearly established the fact that the credit of demonstrating the independence of the two Lakes, now called Eyre and Torrens, does not belong to Babbage.

[2] This information is derived from an article by Mr. Hugh Wright, "The Value of Newspapers—Naming Lake Eyre," *Library Record of Australasia*, Vol. II, No. 2, p. 75.

Fig. 2. DISTANT VIEW OF LAKE EYRE.

Fig. 3. MOUND SPRINGS DEPOSITING TRAVERTINE:
AT THE OLD PEAKE STATION.

plough the salt waters of the lake; in fact before the boat got near the lake the waters had receded far from the shore, and to attempt to cross the treacherous salt flats would have meant certain disaster. There are times, however, when the lake, or at least its southern arm, is really filled with water. As we passed by in January, 1895, the waves, heaped up by a strong wind, were breaking in spray against the low cliffs bounding the shore. This does not often happen, and for the most part it is a scene of silent desolation.

On the western side of the lake, and extending as far as some miles north of Oodnadatta, the country is dotted over with what, from their usual form, are called mound springs (Fig. 3). They vary very much in size, from little heaps to great rounded mounds which may be as much as fifty feet in height. Each one has a stream of water, bubbling up into a pool on its summit, which may be cool or warm or even hot. The temperature of the water in springs quite close to one another will often vary to a large extent. The water is charged with mineral matters, the deposition of which, as the water evaporates, forms the mound of sinter or travertine. This is usually black with decaying vegetable matter, for the mounds are clothed with rushes and grass, which remain bright green and form striking objects in a country where everything else is parched and brown. As a general rule, the little stream which trickles away from the mound is bordered with white sinter. At the Peake station, where we spent some time with our friend the late Mr. E. C. Kempe studying the habits of the Urabunna tribe, the springs, though not each one very large in size (as they are, for example, further north at Dalhousie), formed very striking features in the landscape. The view (Fig. 4), which is reproduced,

gives a very good idea of this part of the country. It is taken from a range of low hills, looking out to the north-east across the dreary flat country bordering the shores of Lake Eyre, which is distant about twenty miles. In fact the hills, which can be seen trending away towards the north, form the western limit of the Eyrean basin in this part of the country. The margin of the hills is lined by numberless mound springs, the water apparently rising to the surface where it meets with the granitic rock as the latter dips beneath the more recent deposits forming the vast plain stretching away to the horizon. The hills are fringed with lines of white travertine deposited by the waters which rapidly evaporate as they overflow from the springs.

A few miles to the north of the spot at which this photograph was taken, we were camped with some old natives of the Urabunna tribe by the side of a waterhole called Tjantjiwanperta. The country would not be called attractive by the ordinary tourist, but to the aborigine it is his home. Every rock and waterhole is associated with traditions of his ancestors. The hill close by our camp, which the white man calls Mt. Kingston, he calls "Korara merkunda," which means "clouds arising" and reminds him of the far past mythic times when certain of the ancestors of the tribe—the forefathers of the present rain-men—arose from the ground in the form of a great cloud. Because they were thus the earliest rain-makers their descendants are now able to do the same. While we were with them, the leading rain-man performed a ceremony, and, within two days of the performance, there was a downpour—possibly associated with the fact that it was the usual time of the year for rains to fall in that part of the country. Whether this was so or not, at all events the reputation of the rain-maker as a magic man of no mean order was firmly

Fig. 4. RECENT DEPOSITS FORMING THE PLAINS AROUND LAKE EYRE INFRINGING ON THE OLDER GRANITIC ROCKS FORMING THE SURROUNDING HILLS. THE MOUND SPRINGS ARISE AROUND THE MARGIN OF THE PLAIN.

Fig. 5. GIDDEA TREE.

established. We had been camping out in the open, but were fortunately sheltered under the hospitable roof of our friend Mr. Kempe before the efforts of the rain-maker were crowned with success. When next we saw him he was brimming over with undisguised, but at the same time dignified self-satisfaction.

Our camp at Tjantjiwanperta was in a little valley amongst low-lying hills, through which, in rain times, the water drains away on to the Lake Eyre plains. Here, sleeping on the ground in the open at night and sheltered from the sun during the day by a friendly clump of giddea trees (Fig. 5), we spent some time with a few old men of the Urabunna tribe. Giddea, variously spelt Gidya or Gidgee, is the native name, in New South Wales, for a species of acacia known scientifically as *Acacia homalophylla*, and popularly as the stinking acacia. The latter name is due to the fact that, in the flowering season, or when the leaves are damp, the tree has a strong and most objectionable smell. When young it forms a thick shrub, with a dull, olive-green foliage, but, when older, it grows into a rather rugged-looking tree, reaching a height of perhaps fifteen or twenty feet. Like very many of our acacias, what is commonly spoken of as the leaf is, really, only the flattened-out leaf stalk ; the true leaf is quite wanting, but the stalk becomes so modified that it assumes the shape and takes on the form and functions of a leaf. In some of the acacias, and more especially in the one commonly known as the golden wattle, of which the masses of yellow blossom give rich colour and perfume to many a hillside in the early spring, the transition from leaf to leaf stalk is very clearly seen in the young plants, which alone have the feathery leaves characteristic of the silver wattle. In some cases the leaf

and stalk are normal, in others the leaf is present and the stalk is flattened out, while in others the leaf has been suppressed and the stalk, simulating a leaf, alone remains. When the plant is fully grown there is rarely any trace of the true leaves, and the stalks, which do duty for them, are very similar in shape to many gum tree leaves.

There had been a considerable rainfall a month or two earlier and evidently water had been lying for some time in the slight hollows in the ground, many of which were filled with masses of nardoo (Fig. 6), a plant that is very characteristic of the dry interior. Each one forms a little clump with a mass of green trefoil leaves, the stalks of which are long enough to allow them to float on the surface of the shallow water. The most interesting part about it, however, consists in the spore cases which are formed just at the base of the leaf stalks. They are, when ripe, very hard and wooden in appearance, but the natives make a kind of flour out of them by grinding them to powder between their so-called nardoo stones. The latter consist of a larger nether and a smaller upper or grinding stone. The former varies in length from one to three feet, in width from less than a foot to two feet, and in thickness from three-quarters of an inch to perhaps a little more than an inch. The upper stone, which may be circular or elliptical in outline, is always very much smaller than the lower one and capable of being easily handled. These stones or mills are very highly valued and are traded over long distances, as they are found in camps often more than a hundred miles away from the nearest available supply of sandstone rock, out of which they are made. They are much too heavy to carry about on ordinary journeys, and so are left in the camp, securely hidden from view, when the natives move on from one camp to another.

Fig. 6. CLUMPS OF NARDOO PLANT GROWING IN A SLIGHT DEPRESSION WHERE WATER HAS STOOD FOR SOME TIME.

Fig. 7. KOCHIA SHRUB IN FULL FLOWER.

It was upon this nardoo that King, the sole survivor of the Burke and Wills expedition, was subsisting precariously when he was found by Dr. Howitt on the banks of Coopers Creek.

In addition to the giddea, which formed the prevailing scrub tree, and the nardoo, which was only present in patches, there were other plants very characteristic of the country—most of them, however, not growing beyond the size of small bushes—such as the Kochia, called "Katnunga pitingura" by the natives, which means "home of the wallaby," in allusion to the fact that it often forms a shelter for a small species of this animal (Fig. 7). Then, again, there was the wild geranium, the salt bush, and species of plants many of them soft and pliable enough at this time of the year, but with fruits which hardened as they ripened and developed sharp, piercing spines and thorns. Amongst the latter kind of plants the most common was a creeping species of Tribulus. The large yellow flowers are very attractive, but its dry prickly seed cases (Fig. 8), popularly known as "three-cornered Jack," are more than irritating when you have to come amongst them. Quite as irritating, though fortunately not quite so plentiful as the Tribulus, are various species of Bassia. Their seed cases have a pretty, downy centre, half an inch in diameter, but projecting from this are a number of stiff, sharp spines.

We had taken a few of the older men into camp with us, as we wanted to have a quiet time with them, and find out as much as we could about certain of their beliefs and customs, so as to be able to compare them with those of the Arunta tribe which adjoins them on the north, and we spent some very pleasant days in our camp amongst the hills at Tjantjiwanperta. The country round about Lake Eyre has been opened up for many years, and the railway,

north to Oodnadatta, now runs across the old hunting grounds of the Urabunna, whose numbers have dwindled very considerably. The general barren nature of the country and its liability to long droughts, during which animal and plant life become decimated, must, however, have prevented the possibility of the existence of a large human population. This, of course, refers to the country under the climatic conditions at present existing. In, probably, Pleistocene times things were quite different. A chain of fresh water lakes, fed by large streams, then occupied the present Eyrean region. Their waters, as we know from fossil remains, were occupied by animals, such as crocodiles and lung-fishes (Ceratodus), now only found in more northern, fertile parts. Amongst the abundant herbage growing on their banks browsed the huge Diprotodon and other marsupials, now quite extinct. At that time, when the food supply was plentiful, the land could easily carry a population such as could not possibly exist under present conditions ; but whether in those far back times it was, or was not, inhabited by human beings, we have, as yet, no evidence to show.

Nowadays the remnants of the Urabunna tribe are gathered together at the few outlying cattle stations, such as the Peake, where, in return for clothes and "tucker," they help in the work of the station. They have long since, except in a very small way, given up the performance of their old ceremonies—even the ordinary corrobborees have dwindled down to a mere nothing—and only the older men know anything about, or indeed take any interest in, matters of tribal lore.

We spent hour after hour, under the shelter of the giddea trees, learning all that we could about them. Physically they are closely similar to the Arunta ; in fact the only way in which you could distinguish an adult,

Fig. 8. "THREE-CORNERED JACK."

Fig. 9. MAN OF THE URABUNNA TRIBE, SHOWING THE CUTS ON THE BACK.

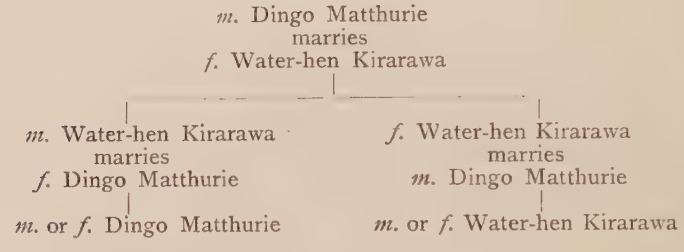
fully-initiated Urabunna from an Arunta man would be by means of a few curious, regularly arranged scars, perhaps half a dozen in number, down each side of his backbone (Fig. 9).

The Urabunna tribe occupies the country lying on the north-west side of Lake Eyre; southwards it is in contact with the Dieri tribe and northwards with the Arunta, whose southern boundary is approximately Oodnadatta. It belongs to a group of tribes which has been called the Dieri nation by Dr. Howitt, after the tribe which forms perhaps the most important member of the group. Like every tribe in this nation, the Urabunna counts descent in the female line. The whole tribe is divided into two groups or classes called respectively Kirarawa and Matthurie, and every individual belongs to one or other of these two, just exactly as if, amongst ourselves, every one was either a Brown or a Jones. Matters are so arranged that a Kirarawa man may only marry a Matthurie woman and *vice versâ*, and there is no such thing as the woman changing her name when she marries. If she be Kirarawa, then Kirarawa she remains all her life, and not only is this so, but all her children, boys and girls alike, are Kirarawa.

Further still, not only has every native one or other of these names, but, in addition, he or she belongs to a group of individuals bearing the name of some animal or plant or material object, and these groups are divided between the two main divisions Kirarawa and Matthurie. These animate or inanimate objects are called totems, so that every individual has both a class and a totem name. Kirarawa has wild duck, cicada, wild dog, emu, wild turkey, black swan, etc., while Matthurie has cloud, carpet snake, lace lizard, pelican, water-hen and crow. Not only must a Matthurie man marry a Kirarawa

woman, but if, for example, he be a wild dog, then he must marry a water-hen, and his children are not only Kirarawa, like their mother, but they are also water-hens.

Marriage and descent, both as regards class and totem, in the Urabunna tribe can be represented by the following diagram, in which the letter *m.* signifies a man and *f.* a woman :—



The animals and plants are supposed to be intimately associated with the men and women who are called after them ; in fact the general idea amongst the natives is that, in the far past times, there were no men and women, but only creatures who were half animal or plant, and half men or women. From these semi-human beings sprang the ancestors of the present tribe. Not only is this so, but each of these far-away, mythical creatures carried about numbers of little spirit creatures—a wild dog had little wild dog spirits, a water-hen had little water-hen spirits—and, as they travelled over the country, being much more gifted than any of their purely human descendants, they not only created all the natural features—hills, rocks, mound springs, waterholes and creeks, which now form landmarks in the Urabunna country—but they actually peopled them with spirits. Each particular hill, or even rocky prominence, is supposed to have been made by some old ancestor and to be the home of spirits which were deposited there. In our

camp at Tjantjiwanperta we slept every night at the base of a group of granite boulders (Fig. 10) which arose to mark the spot where certain of the mythic ancestors of the tribe (who, in this instance, were pigeon people) camped during their wanderings ; and these boulders are now the home of pigeon spirits, left behind by the forefathers, who wandered over their ancestral domains just as their modern descendants do—or rather did, until the white man appeared upon the scene. Every child that is born in the Urabunna tribe is supposed to be a spirit child come to life again. The child grows, and when, in the course of events, it dies, either young or old, its spirit part returns to its old home, only to remain there until such time as it is once more born in human form. These Urabunna people have also evolved the very comforting and fair belief that, if you are a man in one life, you will be a woman in the next, and so on *ad infinitum*.

As an example of their traditions, we may relate one referring to an old ancestor of the rain men and women. In the far past time, which the Urabunna call Ularaka, an old man arose from the ground together with a little boy. The old man had plenty of gypsum—a substance often associated with rain-men because it is white like the clouds. While the boy slept, the old man ground up a lot of his gypsum and threw it into the air, where it formed clouds, and after a short time they came down to the earth in the form of rain men and women. Time after time they went up into the sky, in the form of clouds from which the rain poured down, until it filled all the clay-pans and the creeks ran. Meanwhile, in the Arunta tribe, away to the north, there was another rain-man, and all day long the Urabunna man could see him making clouds that hung in a long low line on the horizon. Gradually the clouds came nearer, until at last

they were close to what is now Mt. Kingston, though at that time there was no hill there at all. The Arunta man said, "I saw your lightning," and the Urabunna man, who was angry with him for coming near, said "What do you want to come up and look at my Churinga[1] for?" Now the Urabunna man had five stripes—three of white and two of red down—which he wore across his stomach when he made rain, and these were his Churinga. The Arunta man managed to steal four of them, with which he returned to his own country, leaving the Urabunna with only one stripe, so that when the rain-man performs at the present day, he actually only wears one. The old Urabunna man then determined to travel, and took all the blackfellows whom he had made on his back, the boy mounting on to the very top. At the present day a great heap of weathered boulders with one perched on the top represents the spot where this took place (Fig. 11). They travelled on, sometimes going up into the sky, sometimes travelling underground, but always leaving spirit children, called "maiaurli," behind wherever they camped. At length they met another old rain-man, with his cloud of blackfellows. They all mixed together, and finally travelled on into the country of the Wonkgonguru tribe, where they went into the ground, leaving plenty of rain spirits, or maiaurli, behind them. It is these spirits, left in various spots, all of which are perfectly well known to the natives, who give rise to the rain men and women of the present day.

Just as the rain-men are supposed to be responsible for the supply of water, so the men of other groups have charge of the supply of the animal or plant which gives its

[1] Churinga is the name given to certain special objects possessed by the old mythic ancestors and hence regarded as sacred. In this instance they were five bands of birds' down.

Fig. 10. PIGEON ROCKS AT TJANTJIWANPERTA.

Fig. 11. RAIN-MAKER'S ROCKS AT TJANTJIWANPERTA.

name to that group. While we were at Tjantjiwanperta, the old headman of a snake group, called Wadnungadni, showed us the ceremony which he performed when he wanted to increase the snakes. First of all he decorated his body with lines of red and yellow ochre and made a curious ceremonial object called "pariltja." It consisted of two sticks, each about two feet in length, fastened together at right angles (Fig. 12). Strands of fur string stretched across from stick to stick so as to form a small kind of banner. Each of the four ends was ornamented with a tuft of white cockatoo feathers, and he wore it lying flat on his head. Together with four or five other men, he knelt on the ground, one of them beating time to the accompaniment of the following refrain :—

Lirri watthai umpai
Lara nalari tjinta.

The performer then extended both arms at full length, holding in each hand a sharpened bone, about six inches long. A man on the right took the bone out of that hand and pinched up the skin of the arm, while the performer, with his left hand, thrust the bone right through it. Another man, on the left, lifted up the skin of that arm and the performer thrust the second bone through it. With the bones still in the skin and with his arms extended, he fiercely sang the above refrain, after which he pulled out the bones and the performance was over. It must be a rather painful ordeal to the performer, whose arms were marked with many scars. He told us that sometimes he uses three or four bones for each arm. When not in use they are wrapped in hair cut from the head of a snake man. After the ceremony of course snakes become abundant, and then some of the other men go out and bring a snake in to the old man, saying "Auuta nanni obma," which means "See, here are snakes." He rubs his arms

with a little of their fat and says "Unta tani urquari," which means "You eat—all of you." No one may eat snakes until the old snake man has thus given them permission.

Like all savage tribes, the Urabunna people appear to feel the need of accounting for every prominent natural feature in their country, and they therefore have recourse to the invention of myth. The mound springs, so characteristic of their country, must be explained, and accordingly we meet with a tradition of two old snake ancestors, one a brown and the other a green snake, who walked over the country and whose mission it was to make the mound springs; or, rather, as the natives say, these sprang up to mark the different spots at which they rested during their travels.

The final ceremony of initiation to manhood in the Urabunna tribe is called Wilyaru, and the same name is given to men who have passed through it. The most important part of the ceremony consists in making cuts on the back, one in the middle line of the neck and four or six others down each side of the backbone. It is of course necessary to have an explanation of these marks, which are supposed to represent those on the bell bird, and—abbreviating what is a long myth full of the most minute detail, for the native is nothing if not painfully precise in regard to the most trivial details—the account is as follows.

Long ago, in the Ularaka, there lived two hawks. One was called Wantu Wantu and the other Irritja, and each of them owned a tree with a nest and two children in it. Wantu Wantu was the bigger of the two, and he used to make Irritja catch blackfellows for him to eat, while Irritja himself only fed on wallabies.[1] Irritja always

[1] A small kangaroo.

Fig. 12. SNAKE CEREMONY, URABUNNA TRIBE (p. 23).
The snake man is piercing the skin of his arm with a pointed bone.

Fig. 13. THE OVERLAND TRACK (p. 31).

went in the lead so that he could give the men warning to run away, and for days he never caught more than one at a time—he had to catch one or else Wantu Wantu would have been very angry. Day after day he went out with the same result, Wantu Wantu always seeing plenty of blackfellows and unable to understand why his mate could not catch more. Every day they returned home and Wantu Wantu fed his pickaninnies with human flesh, but Irritja gave his only wallaby. One day they caught a man suffering from boils, another day a cripple. At length the time came when they had to go further afield, and, as their children had grown, they could leave them for a few days at a time. They went up into the sky, and, after playing about there for a short time, came down to earth and found a camp of blackfellows, of whom three went into a hole, while all the rest ran away as hard as they could. Wantu Wantu searched around thinking that others must surely be hiding somewhere in the scrub, but, though he saw plenty of tracks, he could not find anyone. At last he gave up the search and came back to the hole, but it was so small and he was so large that he could not get in. Irritja told him to try again, but it was no good, and he felt just like crying. He thought to himself "What shall I do? I will get a forked stick." So he did, and raked round the hole with it, but it was too straight and he could not catch the men. At last he got a stick with a crook at the end, and, one by one, he caught the three blackfellows by the leg, hauled them out, killed and cooked them. He only ate one himself and kept two for his pickaninnies. Irritja, as usual, contented himself with wallabies, and they went back to their camp together, Irritja, as was customary, in the lead, Wantu Wantu some little distance behind. As soon as ever he got into the camp, Irritja saw a

little hawk there, called Kutta Kutta, and said to him: "Hallo, are you here all alone? The old man Wantu Wantu is coming up behind; you had better run away quickly." But little Kutta Kutta, who had a very good opinion of himself, said "No, not I; if the old man wants to fight, let him come on. I am not afraid of him." Irritja, not wishing to see the little fellow killed and eaten, said, "No, you must go away quickly, before the old man sees you. It is no good you staying to fight with him." But Kutta Kutta would not go. Wantu Wantu meanwhile had caught sight of him, though he said nothing. As soon as ever Kutta Kutta saw Wantu Wantu he changed his mind and said, "Hallo, which way shall I run?" Irritja said, "No, it is too late now; you cannot run away." Kutta Kutta said "I think I will go under your wing," but Irritja said "No, it is too late now, you must just stay where you are." "Oh well," said Kutta Kutta, who was terribly frightened, "I will lie down on the ground and look like bark." Irritja, to try and help him, threw some soil over him, though he knew that Wantu Wantu had caught sight of him. Wantu Wantu came and said "Where is Kutta Kutta?" though all the time he knew quite well where he was. Kutta Kutta lay low and said nothing. Irritja said "I do not know which way he has gone." Wantu Wantu pretended to search for his tracks and, after a short time, said "Oh very well, I am not going to bother about him, I am going to light a fire." He did so, and when it was burning brightly he said "I will put the bark on," and picked up the little Kutta Kutta and threw him into the flames. Kutta Kutta was of course badly burned, but he managed to flutter out, crying "Tuk tuk tuk," just as he does at the present day, and ran away as hard as ever he could. Old Wantu Wantu chased him but could not catch him,

though he got hold of him once or twice, but the fire had burned his feathers off and he was very slippery. He followed him until sunset and then gave up the chase saying "Oh very well, let him go; I must get back to my children." Kutta Kutta ran on until he came to the camp of a bell-bird man who had married his sister and was living there with some other men. They were all away from their camp when Kutta Kutta came, so he hid amongst the bushes. By and by the man came back and sat down. Kutta Kutta moved slightly, and Baku Baku, the bell bird, said to his companion Kata Kata, a little lizard, "Hallo, what is that? Do you smell anything burning." One after the other those in camp began to notice the burning smell, but they could not understand it, until at last Kutta Kutta, when he heard them all talking, came out and told them that the old Wantu Wantu had put him on the fire. They said, "All right, we will kill him." Early next morning Baku Baku the bell bird, and Kata Kata the lizard, told two Itjungarara, painted-finch men, to take their tomahawks and go to the camp of Irritja and Wantu Wantu while they were out in the scrub. There they were to chop the trunks of the two trees holding the nests until only the bark was left to support them. The finches did this, and then Baku Baku with Kata Kata and their friends, marching in two columns, surrounded the trees and waited quietly, hiding in the bushes. By and by Irritja and Wantu Wantu came home, Irritja carrying wallabies and Wantu Wantu dead blackfellows. Wantu Wantu tried to throw the bodies up to his pickaninnies in the nest, but each time he tried they went into Irritja's nest. Wantu Wantu asked Irritja to throw his wallabies to the young Wantus, but he declined. At last Wantu Wantu and Irritja flew up into the air, and, after circling round and round, settled on their nests and down came

the trees with a crash. Before they could get clear of the boughs, the natives, led by Baku Baku the bell bird, rushed out upon them. First of all they broke one of Irritja's arms, but he cried out saying "Do not kill me; I do not eat blackfellows; you kill Wantu Wantu and his children." They did so, and kept Irritja alive. When all was over Baku Baku said, "I think it would be a very good thing for all of you to make the same marks on your body that I have on mine. I have killed the old Wantu Wantu for you." They all agreed that this would be the right thing to do, and while they made the marks, they sang the bell bird song :—

Baku Baku wa yan thidna we
Win muru
Win muru Baku Bakungu.

This is why the natives now make marks on the backs of the Wilyarus and why they will not eat the hawks Wantu Wantu and Irritja, because one of them used to eat blackfellows and the other tried to help them to escape.

CHAPTER III

FROM OODNADATTA TO CHARLOTTE WATERS

The manner in which you travel in the Central area—that is, between Oodnadatta in the south where the railway ends and the Macdonnell Ranges in the north—depends very much upon the nature of the season and upon what you want to do. In early times the explorers had no alternative. They were obliged to take horses and to accept the risks attendant upon the probable scarcity of water and their total ignorance of where the few scattered waterholes were to be found. If they were fortunate in this respect, as upon the whole was McDouall Stuart, then, apart from the hostility of natives or failure of food supply, they could, with more or less difficulty, penetrate the unknown country; but if, like Sturt, one of the ablest of their number, they chanced upon bad seasons, or struck country where, even in good times, water is rarely met with, then they were completely baffled in their attempts. No amount of bushmanship will suffice to take horses and human beings across more than a certain extent of absolutely dry country, and only those who have crossed the Central area, since it has been opened up by the early explorers, can realise the difficulties with which they had to contend. Australia cannot be congratulated on the way in which she has treated their

memory. Possibly in the Federal Capital, room may some day be found for memorials which shall be worthy of their gallant efforts.

In the year 1866 Sir Thomas Elder, to whose enterprise South Australia owes very much, introduced camels into the country, and thenceforth the explorer of Central Australia was rendered largely independent of water supply. Not only will the camel carry water for the use of the human members of the party, but it will itself do without any for long periods. It is, however, a common error to suppose that camels normally, and of their own accord, go without drinking. Under ordinary conditions they drink daily just as a horse does, but they can be trained gradually to endure long abstinence. On one of the expeditions fitted out by Sir Thomas Elder, the animals actually performed a waterless march of twenty-four days, which is, we believe, the record in this respect. Not only are they almost invaluable in this way, but at the same time they can carry much greater burdens than horses. A strong bull camel will carry upwards of eight hundred pounds day after day, and, in addition, they can feed on almost anything. If you are travelling with horses you must take care to be at a waterhole almost daily, and you must also look out for a spot where there is something in the nature of grass, however dried up it may be, on which the horses can feed ; but both of these conditions can be disregarded in the case of camels. They will, when trained, do without water for many days, and will feed with apparently equal relish on the succulent Claytonia or the most spiny acacia. The introduction of the camel has indeed revolutionised travelling in Central, and in the drier parts of West Australia.

The first time that one of us traversed the Centre—the Far North as they call it in Adelaide—was as a

member of the expedition organised by Mr. W. A. Horn. The object of the expedition was not that of exploration in the strict sense of the term. As a matter of fact, apart from the discomforts attendant upon a precarious water supply and travel in wild and, for the most part, sterile country, where heat, dust, flies by day and mosquitoes by night make life at times anything but pleasant, there is no more difficulty in following the track (Fig. 13), which, for the most part, runs by the side of the overland telegraph line, than there is in traversing any country where the traveller must carry with him everything that he requires and where macadamised roads, railways and hotels are as yet unknown. Once off the main track things are of course different, and as our object was to traverse the Macdonnell Ranges and, if possible, penetrate the desert country in the region of Lake Amadeus, it was necessary for us to have a very considerable equipment and to travel with camels.

In Central Australia there are only two seasons, a winter which lasts from May to September and a summer occupying the rest of the year. There is no such thing as winter, spring, summer and autumn, and, if you can travel when you like, it is advisable to choose the winter months. Then at least you are free from the intense heat of the summer, in fact the climate is delightful, and you can travel by day without being eaten by flies and sleep at night without being tormented by myriads of mosquitoes.

It was early in May, 1894, when those of us who were to take part in the Horn expedition arrived at Oodnadatta. Our party comprised Mr. W. A. Horn, who accompanied us along the main track for about two hundred miles; Professor E. C. Stirling, who was in

charge of the anthropological work; the late Professor Ralph Tate, who acted as botanist and geologist; Mr. A. J. Watt, who collaborated with Professor Tate in the geological work, and one of us who went as zoologist and also had charge of the photographic work. To the late Mr. C. Winnecke, well known for his explorations in Central Australia, was entrusted the guidance of the party. It was arranged that the scientific staff should decide upon the route to be followed and the spots to be visited, and that, having done this, the safe conduct of the expedition should devolve upon Mr. Winnecke, provided of course that, with his previous knowledge, he considered the scheme to be a practicable one. As Mr. Winnecke took a keen interest in scientific work, we had no difficulty in carrying out this plan.

Geographically we did not explore, nor had we any intention of doing so, during the very limited time at our disposal. Scientifically we did, and it may fairly be said that the result of our work was to add very considerably to the geological, physiographical, zoological, ethnological and botanical knowledge of the interior of the continent.

The two or three years before our visit had been seasons of drought, but, fortunately, a few months prior to our start there had been a succession of good summer rains, and, though the country was dry enough, yet we could feel sure that the isolated waterholes would last during our visit, and that, taking ordinary precautions, we need therefore have no trouble on the score of water—the one element of importance which must be carefully considered when travelling in Central Australia.

None of us had had any previous experience of camels, away from zoological gardens, and it was a novel experience to find ourselves in camp with twenty-five of these

Fig. 14. WATERING CAMELS IN THE BED OF THE FINKE RIVER.

ugly, ungainly beasts sitting around, waiting to be saddled and packed. We soon made acquaintance with them and their ways, however, and travelled a distance of some two thousand miles on their backs under a blazing sun before, without the very slightest regret, we parted with them. Our first experience of a camel was not a fortunate one. We did not then realise that there is as much difference between a loading and a riding camel as between a rough draught and a riding horse. All our camels were of the heavy type, and, as a consequence, our opinion of camel-riding was not altogether a favourable one. Looking back upon this expedition, with the experience then and since gained, we can see that things might have been differently and better arranged. A year or two later one of us again traversed the Central area under the guidance of Mr. E. C. Cowle—then in charge of one of the outlying patrol stations, the officers of which have to keep the aborigines in check, should they become at all aggressive—and we appreciated, from the traveller's point of view, the difference between a riding and a loading camel, as hour after hour, though it was midsummer, we ambled along quite comfortably. Of course on an expedition such as the Horn it was necessary to traverse a certain distance daily. We had, in a limited amount of time, to cross a great expanse of inhospitable country, where waterholes were few and far between; and to keep the loading camels, upon whom we depended for our store of provisions, in good condition it was necessary for us to do more or less regular stages, such as they are accustomed to, and, as far as possible, to camp nightly by a waterhole (Fig. 14). At the same time our scientific work required that we should have at least a few hours daily to devote to observation and collecting. The right plan on an expedition of this kind would have been for the few members

of the scientific staff to have had riding camels, as these can travel comfortably at a pace of six to eight miles an hour. Starting early in the morning, we could then have accomplished our day's journey and had the afternoon free for work, instead of toiling along, as we did, at a slow pace of two or three miles an hour, with the result that it was usually sunset when we reached camp. However, one only learns these things by experience, and, until you have had this, you cannot realise what a great difference there is, both in speed and comfort, between a draught and a riding camel (Fig. 15).

It did not take us long to become acquainted with the peculiar character of the camel. "Manners none, customs beastly" is a good deal more true of it than of the savage. In the matter of filthiness, viciousness, and crass stupidity, a loading camel cannot be excelled. The camel saddle, ordinarily used, is a very primitive and cumbersome affair, which must have been invented by those who first domesticated the beast, and has evidently remained as unchanged as the East whence it came. For some reason, the belief seems to be universally held in Central Australia that anyone who wears a turban is capable of taking care of camels. Some of them can, but some of them certainly cannot, or at least do not. However, fortunately for itself, the camel is a hardy beast and does not require much looking after, and its ways are such that one does not feel inclined to waste much sentiment over it. The noble Arabian sheik with his milk-white camel scudding across the desert, who figures so well in Eastern tales, may or may not exist in reality, and he may or may not be filled with that intense affection for his "ship of the desert" which is often so touchingly described. Possibly they introduced the wrong kind of camel into Australia, like the misguided Victorian

Fig. 15. CAMEL TEAM IN CENTRAL AUSTRALIA.

Fig. 16. CAMEL LOADING.

pioneers who introduced the house sparrow in mistake for the field sparrow and have had to pay dearly for their error—or rather other people have had to do so. After a few days' experience—and the feeling deepened as time passed by—we began to realise that the noble sheik and his dumb affectionate companion must follow Tell and the apple into the region of tradition, and that yet another of the picturesque beliefs of our childhood had resolved itself into a myth.

Our caravan consisted of twenty-five camels, six of which were used for riding, the rest being loaded with our stores and collecting material. We had with us two Afghans who took charge of the team, two white men who acted as general assistants, a cook who superintended the commissariat, and two "black boys" who acted as trackers. Each of us loaded his own camel, and, until you have had some little experience, this is not a very easy matter if your load is to ride safely all day long (Fig. 16). First of all you must get the saddle on. This is a weighty affair about five feet in length. It consists of four V-shaped pieces of wood fastened together by longitudinal bars in such a way that, when the saddle is on the animal, two of the V's are in front of and two behind the hump. The inner sides of the bars are padded, so as to prevent any chafing of the skin. The next business is to fasten the girths, one passing in front of and one behind the hard callosity on the animal's under surface. As the beast sits down flat on the ground, this is not always an easy matter, especially as the camel, if in a bad humour, which is its normal condition, is not disposed to help you. As a general rule you have to scoop out two holes in the sand on which the animal is sitting so that you can get the girths round under its body, and this is done to the accompaniment of

groans and grunts and, very likely, an attempt to bite, which is very disconcerting to an amateur at the work of camel-loading. When once the saddle is fixed, then you are faced with the difficulty of arranging your baggage so that it shall stay in its place. This is no easy matter, because the movement of an ordinary loading camel is a combined pitch-and-toss and roll, and you have to provide for a fore-and-aft and sideways motion of the most perplexing kind. After you have carefully fastened your luggage on to the front part of the saddle and arranged your rugs, so as to form a seat for yourself, between the two hinder V's, there remains the difficulty of mounting the beast. The reins consist of two strings tied to a small double-knobbed piece of wood which pierces one nostril of the animal in such a way that one knob is inside the nose and the other outside.

The two strings are attached to the outer knob, and one passes round either side of the animal's neck. A more primitive or utterly inadequate arrangement for guiding a beast can scarcely be imagined. Fortunately, the camel is usually quite content to follow the one in front of it, so that it needs comparatively little guidance ; but there is no chance of holding the animal in if, as sometimes happens, it runs away, for of course anything like a strong pressure brought to bear upon the knob, at once pulls the peg out of the hole in the nose. The camel team always walks in single file, with the result that a very definite pad is formed, about twelve or eighteen inches wide; indeed, a pad such as this runs for hundreds of miles towards the centre of the continent. In the case of the loading camels the string from the nose of one camel is tied loosely on to the tail of the animal next in front. Each team usually has the Afghan in charge riding on a camel which has been trained to lead, another

Afghan bringing up the rear so that he can see if anything goes wrong. Of course there is a great deal in the way in which the luggage is packed and balanced. Each animal carries a load on either side, which is hung on to hooks on the saddle by straps or ropes, and these two loads must be carefully balanced if the saddle is to ride comfortably. A third load goes on the top. As a general rule a cow camel will carry up to three or four hundred pounds, but a bull camel will be loaded up to as much as seven hundred and fifty or even eight hundred pounds. The usual day's march is about eighteen or twenty miles, but, of course, this depends on the nature of the country and whether all goes well. If creeks have to be crossed, a good deal of time may be lost by breaking the nose ropes. One of the camels will, perhaps, go down a steep bank with a sudden run; this means a smart pull on the nose rope of the animal next behind. The jerk may, by good fortune, only result in the undoing of the loose knot on the tail of the front animal, but it not infrequently means that the nose peg of the animal behind is pulled out. Whatever happens, the second animal stands still, sniffing the air in an idiotic way, the rest of the team crowding up behind it and getting tangled up, probably with the loss of a few more nose ropes. The damage repaired and the team set in order again, the weary, monotonous march is once more resumed until, just before sunset, the camp is reached. The animals are brought in so as to form a rough semi-circle. Their loads are taken off and placed on the ground so that there is just enough room for the animal to sit between them. It is then hobbled—that is, its two front feet are tied together so that it cannot wander far away—and turned out of camp to find what food it can. The bull camels are much given to fighting, and, when excited,

have a curious habit of forcing air in behind the uvula. The result is that, to the accompaniment of an abominable gurgling noise, a thin membranous bladder gradually protrudes from one side of the mouth until it is as large as the animal's head (Fig. 17). After a minute or two the gurgling ceases and the bladder collapses, like a small balloon out of which the gas is escaping, until it is completely withdrawn. When fighting the beasts become wildly excited. Each one appears to try and twist its front legs round those of its opponent, so as, if possible, to throw it down, while all the while the two are biting one another furiously with their strong canine teeth. Sooner or later one gives in, and then it is a case of a wild stampede, the beaten animal fleeing for its life with its victorious enemy in full pursuit. One night while we were peacefully sleeping on the ground we were suddenly awakened by the wild rush of two bull camels through our camp. Luckily no damage was done, but the infuriated beasts in their mad, headlong rush passed within a few inches of the prostrate body of one member of the expedition.

It takes some little time before you become an adept in the art of mounting a camel. When you have finally arranged your packs on the front part of the saddle, you take a careful look at your seat, which lies behind the hump, wondering if anything special will happen before you are safely there. The only time when a camel is in a hurry seems to be just the moment when you are trying to get on to its back. The best way to do this is to pull its head round to the left side, only you must not pull too hard or the nose peg will come out, and then, as rapidly as you can, you must jump into your seat. Before you are settled, in fact often before you have actually touched the seat, the beast rises with a jerk halfway up on its hind legs—of course throwing you

forwards. Before you can regain your balance up go the front legs halfway, throwing you back; then, without a pause, up go the hind legs again, so that you are seated on an inclined plane with a see-saw movement. Finally, it rises on its front legs and starts off. Its movement is a most peculiar one, and, of all methods of travel, the back-breaking pitch-and-toss and roll of a rough loading camel is the most uncomfortable. Unlike a horse, the camel moves the two near or the two off legs together, as the case may be, so that when it is walking there is a constant see-saw motion. When you want to make the animal sit down you must first of all persuade it to stop, which it is almost impossible to do unless the animal immediately in front of it does the same. It has, by long usage, become so accustomed to travelling in teams and doing exactly what every other member of the team does, the leading camel being always a specially trained one ridden by the Afghan in charge, that it is most difficult to make any one animal act independently of the others. It did not take us long to realise the difference in this respect between an intelligent and sympathetic horse and an utterly stupid and unintelligent camel. When once you have persuaded the beast to stop then you must utter the magic word "husht" until such time as it realises that you wish it to sit down when, with a sudden flop, down it goes halfway on its front legs, then halfway on its hind legs, then comes another forward descent, a final one backwards, and you are free to dismount the beast.

It was early in May 1894 when we arrived at Oodnadatta to find everything ready for a start. In order to test the loads and at the same time give us our first experience in camel riding, we left camp one afternoon and proceeded a few miles north on our journey. It was now winter, and at that time the climate of the

Centre is perfect. The days are warm and the nights cold. All day long the sun shines brightly in a cloudless sky, and at night the stars are brilliant in their clearness. Our daily programme when on the march was much the same, day after day. We were usually up some time before sunrise. A little after sunrise we had breakfast and the camels were brought in. Each of us loaded his own and then off we started in single file. After perhaps ten or twelve miles came the midday halt, when we were glad of any shelter afforded by the thin scrub (Fig. 18). Mounting again we travelled on until dusk brought us to our camping-place for the night. The camels were unloaded, hobbled and set free to feed. The camp fires were lighted, notes were written up, specimens labelled and packed away, and then, after a final pipe, we lay down on the ground and slept in the open. Often it was so cold that we awoke to find our water bags frozen solid; but the air was so dry that we felt the cold but little.

Though there had been good rains some little time previously, the whole country looked dry and withered-up, and such grass as there was was seared and yellow, though it was not really as dry as it appeared to be. A little way to the north of Oodnadatta we passed on to gently undulating country, with low-lying, flat-topped hills and remarkable plains covered with small stones. Nothing could possibly be more desolate than these "gibber[1] fields," as they are called (Fig. 20). For the greater part of the year everything is bare and dry. The horizon is shimmering and indistinct and the level ground is covered with a layer of close-set, purple-brown stones, all made smooth and shiny by the constant wearing action of wind-borne sand grains, for, in winter especially, a strong south-east wind often blows all day long. The first time we passed across these

[1] "Gibber" is a native word for stone. The *g* is hard.

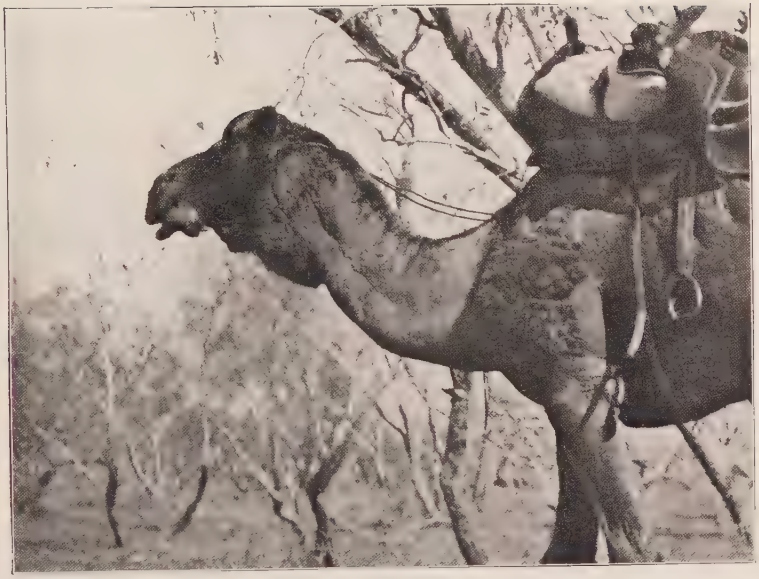


Fig. 17. CAMEL WITH BLADDER PROTRUDING FROM ITS MOUTH.

Fig. 18. MID-DAY HALT, CAMEL RESTING.

gibber fields was in the dry season. There were just a few tussocks of coarse yellow grass; grasshoppers innumerable were hopping about and were the only signs of animal life except a few small lizards. Every here and there a thin line of mulga trees marked the course of a creek which came down to the plains from distant hills, but soon lost itself amongst the stones. There was not a drop of water anywhere for miles around. The next time we passed over there had been a heavy rainfall and everything was changed. A rich growth of grass concealed the stones from view, birds were flying about and the waterholes were full and alive with frogs, crustaceans and water beetles, all as busy as possible.

The entrance to the central area of the continent is certainly anything but prepossessing in the dry season, especially when seen under the glare of the midday sun, and it takes some time to become accustomed to its wide expanses, limited only by the distant line of the horizon, shimmering in the heat waves. The gibber fields alternate with loamy flats covered with grass and scrub. Every now and then the bed of a creek is crossed, in which, for a short time after rain, a few scattered waterholes contain water. You can always tell the whereabouts of these, because if the water stands for any length of time they are bordered by patches of comparatively green scrub and gum trees. One of the surest signs of water in these parts are the flocks of the little gregarious chesnut-eared finches (*Taeniopygia castanotis*), whose twittering is always a welcome sound. As you approach any waterhole they rise in great flocks, and even a small bush will contain eight or nine of their little grass nests. The little birds fall an easy prey to the falcons, who are often seen pouncing down upon them.

One of the most characteristic plants of this part of the

country is the so-called roly-poly (*Salsola kali*). It forms great prickly spherical masses, perhaps a yard or more in diameter, and all day long you see them torn up by the roots and scudding away before the wind across the gibber fields or loamy flats. Though, for the most part, the country is flat or undulating, yet every now and then low flat-topped hills arise capped with a thin layer, perhaps only a few feet thick, of a hard chalcedonised sandstone which has been called Desert Sandstone and which extends over a very wide area in Central Australia. The tops of these hills serve to mark the old level of the country, and as seen in the illustration (Fig. 19), they have a very characteristic appearance. Each has a very distinct table top with a nearly perpendicular escarpment, beneath which the softer rock slopes away, forming a broad base like a great truncated pyramid. So long as the hard quartzite remains intact, the softer rock is preserved, but as the former breaks away, the latter rapidly weathers and the sand to which it gives rise is soon carried away, principally by the wind, though at times it is also removed by running water which, when rain does fall, comes down in torrents. The quartzite again gradually breaks up into smaller blocks which become polished by the wind-blown sand, a thin coating of oxide of iron giving them a purple-brown colour. As the sandy soil is removed the stones come to lie closer and closer to one another, until at last they form almost a tesselated pavement, which covers the dreary gibber fields. In passing from the latter up the sides of the hills the gibbers can be seen in all stages of formation, from the small polished pebble on the plain, to the large irregular block which has just tumbled off from the exposed surface of the Desert Sandstone capping of the hill. If it be anywhere near a waterhole there will be plenty of little roughly-chipped flakes to be

Fig. 19. TERRACED HILLS OF THE LOWER STEPPES, CAPPED WITH DESERT SANDSTONE.

found on the hill top, where the natives have been knocking them off to serve as rough knives.

Desolate as these plains and gibber fields are during the heat and glare of the day, there is just a short time at dusk when they are fascinating in their beauty. The western sky is suffused with a rich after-glow, against which the mulga branches stand out sharp and thin, and all the shrubs and tufts of grass are deep purple in colour as you see them against the golden light. Looking towards the east, the scene is changed completely. The white-blue salt bushes, with pale grey patches of low herbage and still lighter tufts of grass, stand out in strong contrast to the warm, rich brown of the gibber fields stretching away to the horizon, where the sky is a cold, steel-blue melting above into salmon-pink and this into a deep ultramarine speckled with brilliant stars. Gradually the light fades and the outline of the horizon becomes indistinct. Save for the weird, plaintive call of a passing curlew or the pleasant sound of a horse bell everything is absolutely silent. One after another the stars rise in the east and mount higher and higher in the sky, and then, with a feeling of perfect freedom and a delicious sense of absolutely fresh air, as the night wind rises and blows over you, gently rustling the leaves of some old gnarled gum tree, you fall asleep.

In 1894, when the Horn expedition traversed the country, everything was more or less parched and dry, but in 1895 and again in 1901, heavy rains had fallen, and for a time everything was green and fresh. About thirty miles to the north of Oodnadatta the track passes for a time out of the gibber country into the Alberga valley. The fall is so slight that, were it not for the presence of the river course, you would not realise that

there was a valley at all. In the rain season, however, the Alberga serves as a broad channel, carrying large quantities of water into the Lake Eyre basin from ranges, such as the Musgrave, which lie out to the west of the Lake. The river bed is wide and ill-defined and, as usual, is fringed with fair-sized gums (*Eucalyptus rostrata*), many of which grow in the river course itself. During the dry season there is no water, or at most only a few scattered pools, but, at rare and long intervals of time, the stream flows, and then it is not always easy to cross. When travelling through on the Horn Expedition only the presence of the gum trees indicated the existence of a river, but a year later, when it was in flood, we attempted to cross it in a buckboard drawn by four horses. We got into the centre of the stream, which was very broad, though fortunately shallow. Right in the middle, close by what was then a small island, we stuck fast, and it was some hours before we could extricate ourselves. It was, however, such a delightful change to see water actually flowing in Central Australia that we had no regrets at being "stuck up," more especially as it gave us the chance of securing alive a few specimens of a Crustacean of which we had previously discovered the dried "shells" strewn over the ground in one special spot in the Macdonnell Ranges, four hundred miles away to the north of where we then were. It is a little animal called *Limnadopsis birchii*, but, though it only reaches the length of an inch, it is a giant of its kind. The water was so muddy that the animal could only be seen when it was quite close to the surface. On the return journey the river had ceased to run, and no trace of it was to be found in the pools which still remained. The mud had sunk to the bottom, leaving the water quite clear and without a sign of the great majority of the little animals which were darting up and

Fig. 20. GIBBER FIELDS (p. 40).

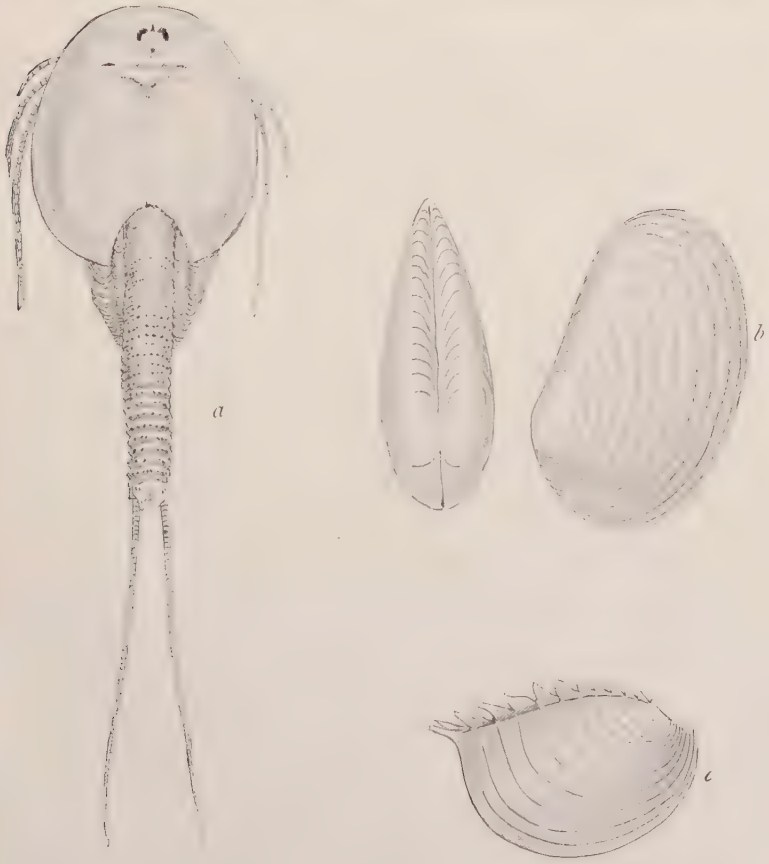


Fig. 21. *a* APUS AUSTRALIENSIS. *b* ESTHERIA. *c* LIMNADOPSIS.

down in thousands only a week or two before. It is a curious thing, which struck us a good deal when first we saw them alive and swimming about in the same water-pool, side by side, that some of these little animals, which are closely allied to one another, have red blood and others have not. For example, the various species of Limnadopsis and Limnetis are quite colourless, whilst their close allies, *Estheria lutraria* and *Estheria packardi*, have red blood (Fig. 21). Whether it be connected with this fact or not, it is interesting to notice that the Estherias seem to be able to live longer than the colourless forms. You find them in every water-pool, long after the colourless forms have disappeared ; and, also, they are much more numerous. Another fact of some interest is that, speaking generally, the smaller the animal is, the more abundantly you find it. Limnadopsis, which is decidedly the largest of the Estheria group, is only rarely met with. We have only once seen it alive, though we have met with its "shells" in abundance at one place in the Macdonnell Ranges and again in the bed of a dried-up creek about two hundred miles further north. Evidently it is very local. So, again, you only find the larger Estheria (*E. lutraria*) in comparatively few parts and in small numbers, but the smaller species are abundant everywhere. The colourless forms do not appear to have as much vitality as those which have coloured blood, and, for some reason or another, they only live in muddy water—at least we could never find a trace of them in water-pools in the sandy beds of rivers where, after a time, everything is clear. Of course part of the muddiness is due to the little animals themselves, as they spend their whole time darting up and down, and so are constantly stirring the mud up, but they seem to thrive on it.

After crossing the Alberga our course lay nearly due

north along the valley of the Stevenson. When we passed through with our camel team in 1894 the country was dry, but when we last went through in 1901, there was plenty of water lying about and abundance of grass with, here and there, patches of the white flowers of the Darling Lily.[1] The river has the usual fringe of gum trees, and the sides of the shallow valley rise and gradually merge into stony upland plains covered with gibbers. We had great difficulty, on our last visit, in getting our stores along, as the track was very heavy and sandy. We were attempting to carry them, as far as the Macdonnell Ranges, in a kind of express waggon drawn by four horses, and after a temporary difficulty in crossing the Alberga, came to what looked like a final stop amongst the sand hills bordering the river banks. Fortunately, after two days, we managed to get some extra horses, thanks to the kindness of the owner of a team travelling southwards, and were relieved from our anxiety just when we thought that we were stuck for some time.

It is only those who have had personal experience of such a part of the world as this who can form any idea of what a terrible pest flies can be when you are camping in the open. Immediately after the rain season they appear in myriads, and for a time are a perfect torment to both man and beast. At night, if it be anything like cool, they rest in swarms on the grass or crawl about lazily, getting into your blankets, ears, eyes, nose, and mouth. As soon as the sun's rim touches the horizon in the morning you hear at first a low buzz which grows and grows in intensity; you wonder if it can possibly get worse, but still it goes on and on, worse and worse, until it reaches a climax, and there it remains all

[1] An amarylid plant, *Crinum flaccidum*.

day long. Any attempt at breakfast must be made before sunrise, unless you wish to eat more flies than meat, for any particle of food is hidden from view by a black, crawling mass, the moment it is exposed to the air. As a matter of fact, after you have been kept awake half the night brushing flies away and have probably got one or both eyes "bunged," you do not feel much inclined to eat. If the flies are quiet, then the chances are that, as soon as the sun sets, you are attacked by myriads of hungry mosquitoes, whose shriller buzz is perhaps even more exasperating than the lower note of the flies. It is simply an alternation of a loud, low buzz by day and a loud, shrill buzz by night. Of course you can avoid the mosquitoes by sleeping in a mosquito net, but in Central Australia the ordinary netting is no use; the only thing that will keep the insects out is cheese cloth, so that you must choose between being bitten by countless insects or smothered under cheese cloth. We used a small cheese-cloth tent for some time, but it was not very much use as anyone entering or leaving it of necessity admitted the flies (Fig. 22).

It is curious how the pests vary at different times. Of course, in winter the flies are annoying during the day time, and when first we went through on camel-back in 1894, having had no experience of a rain season, we thought them rather bad, but on that occasion we had no mosquitoes at all. The next time, which was after heavy rain in 1895, the flies were much worse, but the mosquitoes were far worse than the flies, bad as the latter were. On the third occasion, in 1901, also after heavy rain, the mosquitoes, curiously enough, were only a trifling pest, but the flies were truly awful both by day and night. What determines why, after a rainfall in one season, flies should breed in countless numbers and mosquitoes only

moderately and, after an equal rainfall, in the same place, in another season, the relative numbers of flies and mosquitoes should be reversed, it is difficult to understand.

To horses the flies are even a greater torment than to men. Out of a small team of eight, travelling along the Stevenson valley at the same time that we were last there, in March 1901, every one was completely blinded by the flies. The insects settle like swarms of bees around and upon the eye, attracted apparently by the moisture, and in a short time the soft membranes on the lids are all "bitten" and swollen; a great bleeding sore spreads downwards from the corner of the eye, and in a few hours the animal is quite blind. We were only able to preserve our horses' eyes by continually rubbing them with neatsfoot oil, to which the insects seemed to have a decided objection. A friend of ours, who passed through the experience of a rain season in a bad fly country in the southern Centre, told us that the only way in which he could work at all was to keep the flies off by painting a ring of nicotine round each eye. Of course one can wear a veil, but to be of any service this must be a dense one, must fit quite tightly both above and below, and even then the flies are walking about on the outside in hundreds. A veil is all very well so long as you do not want to collect or see the country, and you can, of course, bore a small hole opposite your mouth, just large enough to admit a pipe stem, the smoke from which may cause the flies some discomfort, though the hole sooner or later admits a few adventurous ones to find their way into your eyes.

Our constant plan was to be up well before sunrise, usually by 4 a.m., and to have a cup of bovril when the weather was hot and of soup made out of "pea

sausage" when it was cold. This, with bread, is really all that you want in the early morning when flies are about. If possible, when travelling with horses, we brought them into camp and saddled and loaded them before the flies were bad ; but as a general rule, in fly country, the poor beasts are so distracted that, even when close hobbled, they travel long distances during the night, and it may be an hour or two after sunrise before your "boys" track them up and bring them back to camp. Along the Stevenson Valley, where the flies were worst, we had to make fires, and saddle and load up under the shelter of their smoke, which, to a slight extent, kept the flies off, though the operation of packing horses under such conditions was not altogether pleasant.

It was a great relief to us when, after traversing the Stevenson Valley in 1901, we left the river course and got on to the open country, where there were a few shallow water-pools, no trees and only thin scrub and tussocks of grass, already dried up. The waterholes gave us enough water for our horses, and there was just enough grass for them to feed upon; and, though the flies were quite numerous enough to be obnoxious, they were as nothing to the plague through which we had passed. We were thankful that our horses had come through without serious damage, and the few bad eyes amongst them would soon become right when once we got on to the highlands of the interior. Four of our horses, of which we had twenty altogether, were town-bred—we had brought them up from Adelaide—and it was curious to note the difference in their behaviour as compared with the bush horses. They had no idea of helping one another to combat the flies ; but no sooner were the others, that is the bush-bred ones, unloaded, than they stood in groups, side by side, so that the head of one horse was close to

the tail of the horse next to it, and in this way they spent hours brushing the flies off one another's heads with their tails.

As for ourselves, we smoked and smoked till we could smoke no more, and then all we could do was to wait patiently for the sunset, when here would be some cessation of the plague. All of us had what is expressively called "bung eye." You suddenly feel a sharp kind of sting and then, in a very short time, the cheek and eyelids begin to swell up until the latter are puffed out with a watery fluid and become tightly pressed together, so that you cannot possibly see anything. It is a most curious and uncomfortable sensation, but not actually very painful. If both eyes become "bunged" at the same time, you are quite blind for so long as the "bung" lasts. Fortunately the worst part of it is over in the course of a day or two, when the watery material begins to be absorbed. The same eye can be "bunged" more than once; each of us had both eyes "bunged" at least twice. We could never make out exactly what the fly did. Of course the moment you feel the sting—and you soon get to know exactly what it feels like—you instinctively, and rapidly, brush the fly off without waiting to make any scientific observations; but it is possible that the real cause of "bung eye" is an attempt by a female fly to deposit her eggs in the soft and moist mucous membrane of the eyelid.

While we were detained in camp in the Stevenson Valley we fortunately met with a few old natives of the Arunta tribe, and were able to utilise a little of our enforced leisure in securing some records of corroboree songs on the phonograph. We had with us both the recorder and the reproducer, so that as soon as the natives had sung, or spoken, into the trumpet we could repeat it. It takes a

good deal to astonish a savage. He is brought up on magic, and things that strike us with astonishment, he regards as simply the exhibition of magic of greater power than any possessed by himself ; but it is a difference in degree and not in kind. He therefore seldom exhibits any great surprise, but on this occasion the natives were certainly astounded, and their general opinion in regard to the phonograph was that there was an evil spirit in the box which caught hold of their voices and could send them out again.

From the Stevenson Valley our way lay, at first, by the side of the telegraph poles, which ran in an absolutely straight line for eight miles across a flat tableland. It would be difficult to imagine anything much more dreary or monotonous. Under ordinary conditions there is not a blade of grass to be seen, and only here and there shrivelled-up bushes of cassia, and, of course, not a drop of water. Even after the rains there is very little grass, but for a short time shallow pools of water fill any little depressions. Both in winter and summer mirages are always to be seen. The line of poles vanishes to a point in the distance, and then, beyond this, it appears to rise again as if there were a number of gigantic poles stretching across a lake. In the distance it looks as if the water were bordered by great trees, but as you travel on they resolve themselves into small bushes, and the lake is as far away as ever. After crossing this plain we spent two days traversing some rough, stony hills, amongst which there are a few giddea creeks, that is, water-courses bordered by giddea trees. Crossing one of these we nearly came to grief. The banks were steep and broken away by the recent flow of water, and at one spot, after the horses had clambered up and the two front wheels were on the bank, the whole heavily-loaded waggon began to slip backwards,

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dragging the horses after it. By good fortune the hind wheels caught in some boulders, and then with a desperate effort the waggon was dragged up, and we were glad soon afterwards to be safely camped in the giddea scrub. The next day we left the hills and, for ten miles, crossed a long open plain. As usual the horizon was shimmering in the heat waves, and above it, in the mirage, we could see the station house at Charlotte Waters, hanging in the air, and to the side of it a line of what looked like gigantic telegraph poles.

On this occasion we camped at the station, but on the Horn expedition in 1894 we took our train of camels across the Coglin Creek, a mile to the north of the little station, and camped there for a day. At that time the water was rapidly drying up, and had a decidedly goaty flavour, which we had good cause to remember, because the casks which contained our supply of drinking water were filled here, and we carried the flavour on with us. In the summer of 1895 one of us spent three or four weeks with Mr. P. M. Byrne, the officer in charge, collecting, with his assistance, a large number of the characteristic Central Australian animals which can only be obtained during and immediately after the rain season; and again in 1901 we both spent some time there (Fig. 23).

The station is placed close to the northern edge of a wide plain. The main buildings form three sides of a quadrangle, the fourth side being closed in by strong gates—or rather it used to be in the early days when it was first built and it was necessary to have protection against the blacks. At that time the doors all opened on to the quadrangle, and every room had loopholes through which, if necessity arose, the officials could defend themselves. In the early days, when the northern railway only reached as far as Port Augusta, there were eight

Fig. 22. CAMP AT WIRE CREEK, WITH FLY TENT (p. 47).

Fig. 23. CHARLOTTE WATERS TELEGRAPH STATION.

hundred miles of, for the most part, dry and often sterile country to be crossed between the head of the line and Charlotte Waters. The distance is now reduced to 150 miles, and the time may come when the railway will be extended still further north ; but as yet all these stations along the telegraph line are completely isolated from the outside world, and Charlotte Waters looks out upon a great open, stony plain without a sign of human habitation (Fig. 24). North and south runs the line of telegraph poles, streaking away to the horizon, and the ticking of the instrument, as the messages pass through, only serves to heighten the feeling of isolation. Up to ten years ago there was only a single iron wire stretching across the continent, and naturally this was liable to interruptions of various kinds. At certain places river courses had to be crossed, and during heavy floods the poles might be washed away, or the wire become entangled in the boughs of a tree, swept down by the flood waters. Or again a mason wasp, if it chose to build its nest in one of the insulators, might seriously interfere with the passage of the current by making a connection between the wire and pole. It was, therefore, essential to have stations at intervals of every two or three hundred miles, where, if the line were working badly, the messages could be repeated, and where also there were officers who, if necessary, could at once start away and repair any break in the line. Horses are always kept in readiness, and as soon as ever an interruption occurs between any two stations, an operator from the southern one starts out north, mounted on horse-back, and one from the northern starts out south. There is no delay ; the operator starts off by himself, but as soon as the other horses can be loaded, a black "boy," attached to the station, follows him with spare horses and provisions. Each operator is

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supplied with a pocket instrument, and every now and again he "taps" the line to find out whether he has passed beyond the point of interruption or whether it has been repaired by the other operator. If he be successful in finding the break, he promptly repairs it, and then, usually without seeing one another, the two operators return, each to his own station.

CHAPTER IV

ANIMAL AND PLANT LIFE ON THE LOWER STEPPES

Amongst the most characteristic features of the Lower Steppe-land country are the so-called clay-pans. These are shallow depressions, sometimes surrounded by sand-hills, but very often lying out on the open, plain country. They are not by any means confined to the Lower Steppe lands; in fact, the largest one that we met with—called Conlon's Lagoon—occupied a valley right in amongst the Macdonnell Ranges, and measured a mile in length by half a mile in width (Fig. 25). From this, which is a very extreme size, they vary in extent of area down to only a few square yards. The depth of water that they contain may be only an inch or two, and, at most, two feet. Whatever may be their size they all agree in one feature, which is that they have no outlet. They are formed in such a way that the water draining down into them can only escape by sinking into the ground or by evaporation. There are of course very many depressions in which a clay-pan is not formed, the determining factor being, apparently, the nature of the sediment that the water contains. If this be simply sandy, then it does not hinder the sinking of the water, but if it be of a clayey consistency, then it forms a thin impermeable film which prevents the percolation of the water, and, as a consequence, a clay-pan is formed, in

which the muddy water remains until it completely evaporates. For the greater part of the year they are quite dry, with the clayey film on the surface of the ground broken up into little curled flakes that glisten in the sunshine. Sometimes, when the clayey mud is thicker, cracks, a foot in depth, run down between roughly hexagonal masses of hard earth, which almost always bears on its surface the characteristic tracks of kangaroos and emus that crossed it, in search of the last remnants of water, while the clay-pan was still moist.

During the dry season everything is parched and silent, with not a trace of animal life except the dead shells of snails and mussels, the carapaces of Estherias and foot-marks of different animals. The margins of the clay-pans are bordered by withered shrubs and tussocks of yellow, dried-up grass, with here and there patches of the dead leaves and hard, wooden spore-cases of the nardoo plant.

The clay-pans have an animal life of their own, which is of very great interest as showing how some animals, which absolutely need water for their existence, can adapt themselves to life in regions which, for the most part, are dry and arid. At the first glance no country could possibly appear more uninteresting to a naturalist, and it is only when you look below the surface that you begin to realise the wonderful vitality and adaptability of the smaller animals. Nothing could be more striking than the marvellous change which comes over these desolate clay-pans within a few hours of the fall of rain. After months of brilliant sunshine, banks of heavy clouds gather on the horizon and slowly overspread the sky. You feel as if the parched ground and the dried-up scrub were silently and anxiously waiting, as you yourself are, almost without hope, to see whether the rain, so sorely needed,

Fig. 26. *a.*—FRESHWATER CRAYFISH, *Engaeus bicarinatus.*
b.—FRESHWATER CRAB, *Thelphusa transversa.*

will actually fall, or whether the clouds will slowly disappear, as they do only too often. A few big drops come down. Then there is an ominous lull, but again the drops fall, and this time there is no ceasing, and down comes the water in a perfect deluge. Only those who have lived in a drought-stricken country can appreciate to the full the sound of falling rain and the sight of running water. At first the water sinks into the ground, but soon the surface soil is saturated, and then it begins to gather in the depressions. The creek beds, which have been dry for months, are filled with running water, which gradually increases in volume until it overflows the low, vaguely-outlined banks, and spreads far and wide over the surrounding country.

One's first experience of a heavy rainfall in the dry interior is not easily forgotten. On one occasion we were travelling along the Finke Valley over country perfectly dry and parched, with no sound or sign of animal life save a few lizards and ants innumerable, and had camped for the night not far from the banks of a creek, the sandy bed of which had not contained any water for many months. However dry a creek bed may be, it is never wise to camp on it during the season when rain may fall, however tempting the soft sand may be as a bed. Even if no rain falls in the actual part where you are camped, it may fall miles away, and then, without any warning, a flood will come tearing down the creek and carry off you and your belongings. Shortly after we got into camp the rain began to fall, and very rapidly the waterholes filled.

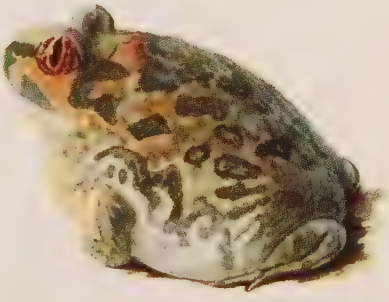
Within an hour the sound of the croaking of frogs was deafening. There must have been thousands of them, though we had not seen a sign of one before the rain fell, for the simple reason that they were all safely buried away, a foot or two down in the sand, where it was cool and slightly moist, or at least not absolutely parched and

dry. In this particular instance it was a special form of frog known as *Limnodynastes ornatus* (Plate I., *a*), which is very often met with when you know where to look for it. It is only about an inch and a half in length, with comparatively short, stumpy limbs, the hind feet being strong and furnished, like all members of this genus, with little shovel plates for digging. In colour it varies, as all Central Australian frogs do, according to the season. During the dry one it is a dirty grey with splotches of darker grey, but, when the rain falls, it brightens up. The general ground colour of the body is then a cream-white with brighter and darker splotches of silver-grey, relieved with circular patches of a bright salmon-pink, the legs being always barred with grey. It does not form permanent burrows, as some of the other frogs do, but lives in the sand of the creek beds, coming out at night-time, when it is comparatively cool, to feed upon any stray insect which may happen to be wandering about.

The habits of this are, however, not so interesting as are those of a larger frog, which is not met with in the sandy creek beds but frequents the clay-pans. We had previously heard of a water-holding frog and were very anxious to make its personal acquaintance. One day during the dry season we came to a small clay-pan bordered with withered shrubs. The ground was traversed by wide cracks and covered with curled-up, glistening flakes of clay. It looked about the most unlikely spot imaginable in which to search for frogs, as there was not a drop of surface water or anything moist within many miles. However, as soon as we asked our native guide to find a frog, he started to search about on the margin of the clay-pan, and in a minute or two pointed out some indistinct marks in the hard clay at the root of one of the bushes. These, he told us, were made

a

b



c

CENTRAL AUSTRALIAN FROGS.

a. *Cheiroleptes platycephalus.* b. *Limnodynastes ornatus.* c. *Helioporus pictus.*

by a frog, though it would require a naturalist as skilled as a native, first of all to find them, and then to recognise them as made by a frog. The ground was as hard as a rock and we had to cut it away with a hatchet, but, sure enough, about a foot below the surface, we came upon a little spherical chamber, about three inches in diameter, in which lay a dirty yellow frog. Its body was shaped like an orange, spherical and puffed out, with its head and legs drawn up so as to occupy as little room as possible. The walls of its burrow were moist and slimy, and the animal was fast asleep with the lower eyelids drawn up so tightly over the eyes that the natives assured us that it was quite blind. The eyelids, moreover, had a peculiar opaque appearance, quite different from that of the frog in ordinary circumstances. Since then we have found plenty of these æstivating frogs, all safely buried in hard ground. This special one proved to be *Cheiroleptes platycephalus* (Plate I., *b*), but at a later time we found that at least one other species of the same genus and two other frogs, *Helioporus pictus* (Plate I., *c*) and *Notaden bennetti*, have adopted the same habit. On squeezing the body water was forced out, and it is this peculiar habit of filling itself with water which enables the frog to tide over, it may be, as long as twelve or even eighteen months of drought. The water is quite pure and fresh, and the natives take advantage of this supply when they cannot otherwise secure any.[1]

[1] In the *Horn Expedition Report* one of us stated that the water was stored in the body-cavity. Since then we have had the opportunity of examining a large number of these æstivating frogs and find that, though a certain amount of water does evidently percolate through and lie in the body-cavity, it is really the thin-walled, urinary bladder which becomes very distended and serves as a receptacle for the water. Whether the water passes directly into this from the alimentary canal or by way of the kidney it is impossible to say.

Every clay-pan has its stock of frogs, and no sooner does the rain fall and moisten the ground than out they come, often in thousands. Within a day or two of the downpour, plant seeds which have lain dormant in the ground germinate rapidly in the warm damp earth, and the seedlings grow with marvellous rapidity. Grubs and caterpillars of various kinds are seen crawling about everywhere, and the frogs simply gorge themselves until they can hold no more, and so also do the natives. Within two days the young tadpoles come out from the spawn, which is laid as soon as ever the frogs emerge from their hiding places. They grow with wonderful rapidity, and at the same time the mature animals change in colour from dirty yellow to brilliant green and orange. Nothing could be more striking than the contrast in colour between a Cheiroleptes in the dry and in the wet season, and this change in the frog from dull to brilliant colour is simply associated with the fact that all the activities of the animal are at their highest point of development. It has to make the most of a very short time; in fact, amongst the thousands of eggs laid, only a mere infinitesimal proportion ever give rise to adult frogs. First of all, the rain which releases the æstivating frogs may not be sufficient to fill the waterholes completely, in which case the young tadpoles soon perish and the old frogs burrow down again. If there be water enough to last for a few weeks, then this means a good season so far as all kinds of animals are concerned; but even if the parent frog avoids capture by a bird, or lizard, or snake, and succeeds in laying its eggs, then the little tadpole, when it emerges from the spawn, has to run the gauntlet of voracious water-beetles and various kinds of water-fowl that appear, as if by magic, when the rains come.

Every animal of every kind seems to be in a state of

feverish anxiety and activity. Hawks of different kinds, from the great eagle-hawk to the little kestrel, are hovering about ready to pounce down upon anything moving. Coots, spoonbills, pelicans, and ducks are busy searching along the margins of the waterholes, or dipping down beneath the surface of the muddy waters, and it is mainly a matter of chance whether, for example, any particular tadpole or frog survives or perishes. Of course, it is a great advantage to a tadpole to develop rapidly; in fact it is only those that do so which have, in ordinary circumstances, any chance of arriving at froghood. In Central Australia everything, in the case of plants and animals alike, depends in the first instance upon this capacity for rapid development. A frog must reach a certain size before it can burrow, and unless it can do this it has no chance of surviving. We have never seen a half-grown frog æstivating, though, of course, it is quite possible that this may take place. As a general rule, the water in a certain number of clay-pans and waterholes remains long enough for a very considerable number of frogs to arrive at maturity, because under the very favourable conditions which prevail in Central Australia when there is a sufficient rainfall, growth takes place with abnormal rapidity. If any one tadpole should avoid the numerous enemies which lie in wait for it at various stages of its existence—water-beetles, birds, and reptiles—it rapidly grows to maturity, but it is only one amongst many thousands that is fortunate enough to do this.

As soon as the clay-pans dry up, the frogs living in them seem to realise that the time has come for them to lay in a stock of water and burrow down into the ground while it is yet moist enough for them to do so. After a surfeit of food in the nature of grubs and insects, the frogs apparently set to work to swallow water. In the

moister parts of Australia the burrowing frogs depend upon the earth, by which they are surrounded, retaining a sufficient amount of water to prevent them from drying up, but in Central Australia conditions are very different, and the frog must provide itself with what water is necessary. The water in the clay-pans is always thick and muddy, but as it passes through the animal's body the mud is withdrawn, and the frog becomes swollen out with clear, pure water, until it is almost like an orange in shape. Then, down it goes for a foot or more into the clay ground, which rapidly hardens, and for the time being absolutely imprisons the animal in its burrow, which just fits the body. Here it goes to sleep, and remains so during the long, dry season, which may last for more than a year. Its bright colours are completely lost; it does not feed at all, in fact it has no chance of doing so, and can only remain dormant and motionless until, once more, the rain softens the earth and the damp, moist heat recalls it to a short but vigorous and restless period of activity.

It is not only the frogs which thus mysteriously and suddenly appear in the clay-pans. A few days after rain-fall the spores of the nardoo plant have germinated, and the surface of the muddy water is flaked with their bright, green leaves, amongst which, until you have had some experience, it is difficult to detect the green heads of the frogs that are croaking vigorously all around you. Countless numbers of Apus and Estherias are swimming about, developed from minute eggs, which, protected by their hard, leathery coats, have probably been blown for scores of miles across the previously arid country from some distant clay-pan in which, months ago, they were laid. Unlike the frogs, the life of these Crustacea is usually a very short one, though of course it depends to

a certain extent upon the nature of the clay-pan into which the eggs may chance to be carried. The larger the clay-pan and the longer the water persists, the greater is the chance of the animal growing to maturity and developing its eggs. In the case of Apus it appears that, even if the water persists, the animal only lasts for a very short time. It has evidently become adapted to a short life ; indeed, long before the water has disappeared in the deeper parts, hundreds of Apus are to be seen struggling on to the margin, and there they lie until they are dried up on the sand, though there may be abundance of water which apparently they have deliberately left. Their greatest enemies are the water-beetles, which are darting up and down, seizing upon and devouring anything which will serve them as food. Often you will see an Apus dashing about frantically, and you will find that two or three beetles have fastened on to it and are tearing its soft appendages. As a general rule, and probably as a means of protection against this particular enemy, the Apus swims on its back near to the surface, so that usually the beetle only comes into contact with its comparatively hard carapace. The beetle is perhaps the hardiest of all the clay-pan animals. When the water dries up it just goes down into a crack in the ground without making any burrow or taking any special precaution, and there it lies quietly until the next rains come.

Many of the pools contain water-snails, and these, though such soft-bodied and moisture-loving animals, have developed a remarkable power of tiding over drought. One day, while digging round the roots of an old gum tree standing by the side of a dried-up creek, we came across a colony of thirty or forty specimens of a small snail called *Bithinia australis*. Each of them had drawn

its body up into the shell and had closed the entrance with a plug of hard, chocolate-coloured earth, quite different in appearance from the earth in which the snails were buried. Evidently each snail had passed the earth through its alimentary canal and had then in some way carefully arranged the little pellets which came out so that they formed a neat and very efficient little plug. We put the snails into a tin and forgot all about them until, fifteen months later, the tin was opened in Melbourne, when to our surprise, on putting them in water, the snails came out, apparently none the worse for their long rest. They were so healthy that they could evidently have stood a few months' longer sojourn in the tin.

Wherever the banks of the creeks were composed of earth which is not too sandy, fresh-water mussels were abundant; in fact the banks of some of the waterholes were strewn with shells which had been broken open by the natives, who find them by the very simple method of feeling for them with their toes in the muddy water. The mussels plough their way down into the bed of the creek as the water dries up. They are not met with in the clay-pans but only in the waterholes along the more or less regular creeks, and the same is true of the crabs and crayfish. It must of course always be remembered that a creek only runs for a very short time—seldom for more than two or three days—after a rainfall, and that for months at a time it is perfectly dry.

Of all places in which to meet with a true crab, sidling away to its hole, the dry Steppe lands of Central Australia are about the most unlikely and surprising. One's ideas of crabs are so bound up with the sea-shore that we were astonished, when walking one day along the bank of a waterhole in the Stevenson Creek, to see a crab making for its hole in the muddy bank. Later on we found that

Fig. 24. VIEW FROM CHARLOTTE WATERS TELEGRAPH STATION (p. 53).

Fig. 25. CONLON'S LAGOON.

the same crab is widely distributed over the Central area, the most northern spot at which we found it being a waterhole in the Stirling Creek, a hundred miles to the north of the Macdonnell Ranges, and doubtless it extends still further northward in the interior.[1] It is apparently the same form, *Thelphusa transversa*, which has been recorded from Cape York in the north-east of Australia, and its presence in the centre of the continent points back to a time when there was a great inland sea. The crab has evidently been left behind and has adapted itself, not only to fresh-water life, but to conditions which would, at first sight, appear to be almost fatal to crab life. It makes a burrow in the bank of a creek in which it can retain water sufficient to keep itself moist and to tide over months of drought (Fig. 26).

The crayfish is identical with the one which, in Victoria, is known as the yabbie, and is always found in waterholes, but it is evidently a very hardy animal, capable of adapting itself to various conditions of life. In Victoria we never find this species (*Engaeus bicarinatus*) except in waterholes which are normally full of water. On the other hand, in both Victoria and Tasmania, there is a special kind of little crayfish (*Chaerops sp.*), popularly known as a "land crab," which is never found in waterholes, but always burrows in more or less damp ground, or under logs, in the scrub. In Queensland the crayfish (*E. bicarinatus*) burrows on hill-sides far away from water, and in Central Australia the same crayfish is frequently met with along the creeks, in the banks and beds of which it forms burrows, often with a pyramidal 'cast' over the entrance. Under normal conditions, in Victoria, it inhabits permanent pools and never needs to form a

[1] We have, since this was written, found it in waterholes about two hundred miles south of Port Darwin.

burrow, though it can do so if necessary. Some years ago, the water was temporarily drained out of a large pond in the grounds of the Melbourne University, and, as soon as it was empty, the crayfish at once burrowed down and the muddy bed was dotted over with scores of pyramidal 'casts' from six inches to a foot in height. It is one of the most widely distributed animals in Australia, the same species occurring in the permanent waterholes of Victoria and New South Wales, on the hill-sides of Queensland, and all over the dry and arid areas of Central and West Australia.

During the dry season, there is very little animal life to be seen on the Steppe lands, except for interminable numbers of ants and, at certain seasons, locusts or grasshoppers. Every now and then a few large red kangaroos or, on the hill-sides, euros[1] will bound away, and perhaps an emu or two, after gazing curiously at the travellers, will think it best to beat a hasty retreat. In good seasons, and in certain parts of the scrub-covered plains where the feed is good, kangaroos may be fairly plentiful, but they suffer severely in times of drought. The few years previous to 1901, when we crossed the continent, had been almost rainless, and during the whole of our expedition we only saw six kangaroos and four emus, and this in parts where previously we had seen them in abundance. A kangaroo can, if necessary, travel a long distance ; but as a general rule it does not wander far afield from its favourite feeding grounds, and when there is a drought in Central Australia, it means that there are hundreds of miles of country without a drop of surface water or, after a time, a blade of grass, though it is wonderful how long the latter will retain its vitality. It has become adapted to an

[1] The euro is a species of kangaroo, *Macropus robustus*, which lives in hilly country.

excessively dry, hot climate and flourishes long after the grass of a moister country would have been shrivelled and burnt up. In some parts big bustards (*Eupodotis australis*) are fairly plentiful on the open plains, and they form a welcome addition to the larder. However bad the season may be, you are certain to see great wedge-tailed eagle-hawks (*Aquila audax*) hovering about or perched on trees, amongst the boughs of which they build their large nests. They are continually pouncing down upon any stray animal running about in the scrub and are strong enough to carry off a wallaby, as we once saw them doing. If any animal, such as a kangaroo, becomes disabled or dies, the eagle-hawks appear upon the scene in a marvellously short time. How they learn, from afar, that the animal is dead is a mystery, but in some way they do ; and almost as surely two or three skulking, snarling dingoes, that is, wild dogs, arrive and dispute with the eagles the ownership of the dead animal.

How the dingo got into Australia is a problem that will probably never be definitely settled. He represents in our island continent the only member of the great group of Carnivora that was privileged to set foot in Australia before the advent of the white man, and he is the only animal that the native has made any attempt to domesticate. In all probability he came into Australia with the emigrants from the north, who gradually spread over the continent and drove before them the original inhabitants. One thing is quite certain, and that is that the dingo came when it was too late to cross on land into Tasmania, which, at an early period, formed but a southern annexe of the mainland. The formation of Bass Strait resulted in the isolation in Tasmania of the relics of the early inhabitants of what was once a larger land mass than the present continent, and neither the dingo

nor the present aborigines, in whose company he probably invaded Australia, succeeded in crossing the strait between the mainland and Tasmania. In Victoria, we have fossil records of dingoes associated with animals which are now confined to Tasmania. There was a time when the Tasmanian "tiger" and "devil," as they are popularly called, the former one of the largest and the latter the fiercest of our marsupials, lived in Australia; indeed the important fact of the former existence of the dingo on the Australian continent, side by side, not only with large marsupials now extinct, such as Thylacoleo, Diprotodon, and Nototherium, but with others, such as Sarcophilus, now confined to Tasmania, was first discovered and announced by the late Sir F. M'Coy thirty years ago.[1] The extinction of the "tiger" and the "devil" on the mainland can only be associated with the fact that here they came into competition with the dingo, which exterminated them. The dingo hunts in packs. Personally he is a skulking coward, whereas the "devil," known scientifically as *Sarcophilus satanicus*, is a fierce, brave little beast who will stand up against any odds. Unfortunately for himself, he has no idea of organisation; if only he had, he could easily have beaten the dingo. The result has been that the "devil," though individually a very much braver animal than his enemy, the dingo, was vanquished by the latter, who somehow came to realise the value of organisation. There may have been some other force at work, but the climate and the nature of the country in south-eastern Australia are just as favourable as in Tasmania. At all events the suggestive fact remains that, where we find the dingo, there the "tiger" and the "devil" have become extinct, whilst in Tasmania, where we do not find the dingo, they have persisted.

[1] M'Coy, *Prodromus Pal. Vict. Dec.*, vii. pp. 7–13.

We have already said that the dingo is the only animal that the aborigine has made any attempt to domesticate, though he has only done this to the extent of taming it, and, so far as we are aware, has not trained it to be of any direct use to him except perhaps as a watch-dog. The domestication of animals and the cultivation of plants played a large part in the early development of the human race, and the acquisition of the power to secure, under normal conditions, a permanent food supply, marks a very important stage in human history. The Australian savage never reached this stage and has therefore remained a pure nomad, entirely dependent upon external circumstances over which he has absolutely no control, though he is convinced that he has. How far the absence from Australia of the higher animals, such as were capable of domestication, is to be associated with the present backward state of the aborigines, can only, of course, be a matter of speculation ; but it is, at all events, a significant fact that the Australian fauna contains no large-sized animals suitable for domestication either as beast of burden or as food supply. On the other hand, among plants, there are undoubtedly not a few which would have lent themselves to cultivation, such as the "yams" and various kinds of grass, the seeds of which are now ground on stone and made into coarse cakes ; but it never appears to have struck the Australian savag that he could either store grain or cultivate it for his future needs.

When riding through the scrub, more especially during the early winter months, that is, in March and April, a most striking feature is the presence of a large number of enormous spider webs ;[1] in fact they are sometimes so

[1] They are made by one of the orb-weaving spiders, *Nephila eremiana.*

large and strong as to make riding through them quite uncomfortable. The web stretches across from tree to tree for a distance of often twelve or even fifteen feet, and reaches a height, in the middle, of fully six feet. During the daytime the spider is almost always to be seen in the centre, and, when disturbed, retreats rapidly along one of the strong side lines leading away into a shrub, where its cocoon can often be found attached to the leaves. Very often we found two webs close together, a larger and a smaller, with spiders of proportionate size; in fact these were so frequently seen as to draw special attention to them, but in every case the animals were females. The largest ones have a body measuring nearly two inches in length, their legs having a total span of four inches, and their huge webs enable them to secure quantities of insects of various kinds. They are only met with during certain seasons, and in April, 1901, when traversing the same part of the country where we found them in abundance in May, 1894, not a single one was to be seen.

The same feature was noticed in regard to a peculiar bag made by the caterpillar of a moth.[1] The bag or case is usually very irregular in shape (Fig. 27), and may measure as much as two feet in length and contain as many as a hundred caterpillars. Presumably it is the joint production of a large number of the latter, whose excrement and hairs fill it with a material which produces very severe irritation if it happens to touch the skin. The natives are very careful to avoid it, believing that it would blind anyone on whose face it might chance to fall. In fact serious results are known to have followed the tumbling down of the case on to a white man sleeping under the gum

[1] Probably belonging to the genus Teara.

Fig. 27. BAG MADE BY SOCIAL CATERPILLARS, HANGING ON A GUM TREE.

tree from which it unfortunately fell while he was there. It is most usually found on the swamp gums and may at times be seen in hundreds, but it is also met with on acacias and cassias. On one acacia we counted no fewer than fifty-seven bags of various sizes. From the bag an irregular track of web-like material can be traced, leading down to the ground. In May, 1894, the cases were filled with caterpillars which came out and fed upon the leaves in such numbers, and to such an extent, that on our return journey, in August, scarcely a leaf was to be seen on the trees, on which the empty cases were swinging about in the wind. Six months later, in January, 1895, the trees were once more green and there was not a single case to be seen, nor was there when we passed through again in April, 1901.

In this instance the bag, which forms a protection for the caterpillar, is fixed and serves as the home of a very large number of insects; but everywhere in the scrub you meet with quite another kind of case, which is made and inhabited by a single caterpillar that carries it about while feeding on the trees. The insect is known popularly as a "case moth," and different kinds are very common in many parts of Australia. The case is formed of an intensely tough web spun by the caterpillar, and is added to as the latter grows in size during the two or perhaps three years which it spends in the grub stage. Different species form different kinds of cases, varying in size and in the way in which they are decorated, and strengthened by the addition of ribs in the webbing or of sticks and leaves (Fig. 28). A very symmetrical one is often met with on the shrubs in the Centre. No foreign objects are attached to it, but the case itself has a very regular shape and is ornamented with flutings. In other kinds the whole surface is covered with numbers of dried

leaves, attached by a part of their margins so that they hang freely, or with little twigs, each one cut off the tree and then sewn on to the case by the caterpillar. Sometimes the twigs are irregular in length, and only attached by one end, at other times all of them are of the same size—perhaps an inch or two long—and firmly sewn on, side by side, so that no part of the actual web can be seen except at the end from which the animal's body projects when it walks about. To this latter form the very appropriate name of "Lictor moth" is given. The caterpillar, except when it is very young and small, travels along the branches of trees and shrubs, clinging on by its legs, its case and body hanging pendent. When it wishes to rest, it spins a thread which serves to attach the now closed-up mouth of the case firmly to a twig, and swings about in the wind, quite secure from the attacks of birds, partly because it is completely hidden, and partly because the bag is so tough and strong that it can easily defy the beak of any ordinary bird, though it often falls a prey to an ichneumon insect which pierces the case and lays its eggs in the body of the caterpillar.[1] When climbing a tree trunk or vertical surface the caterpillar ejects a fine thread from its mouth and, moving its head from side to side, lays down what may be aptly compared to the rung of a ladder. Into this it hooks the claws at the tip of its feet and so lifts its body up and makes another rung a little higher, a thread passing across slantwise from each rung to the one next above. In this way a complete ladder, with the rungs perhaps a quarter of an inch apart and half an inch in length—the size of course depending on the size of the

[1] An admirable account of the habits and life-history of a case moth is given by W. H. F. Hill in the *Victorian Naturalist*, Vol. 15, No. 1, 1898.

grub—will be made, reaching from the ground to the topmost twig of a tall tree. The adult male moth is a very insignificant insect; the female never even develops wings and does not leave the case, the minute grubs which she produces letting themselves down to the ground in hundreds, each one being suspended by a very fine thread. Almost immediately a little conical case, like a microscopic fool's cap, is made by twisting up a little bit of leaf, and during these early stages, when they are on the ground or crawling about, comparatively unprotected, on the leaves of shrubs, by far the great majority of the grubs fall victims to birds. It is just as well that this is so, as otherwise there would not be a green leaf left, for they are voracious feeders and the lifetime of the caterpillar extends over two and sometimes three years.

CHAPTER V

CHARLOTTE WATERS TO THE MACDONNELL RANGES

North of Charlotte Waters the country for many miles is as uninteresting as usual—that is, from a scenic point of view—the stony gibber plains giving place, however, to undulating sandy country with monotonous mulga and giddea scrub.[1] In one or two parts, but only very rarely, we met with a peculiar variety of acacia known as red mulga. It bordered the beds of dry watercourses which ran across a special narrow belt of country, and we never met with it save in this limited area. The tree (*A. cyperophylla*) reaches a height of twenty feet, and its bark, alone amongst acacias, is deciduous, peeling off in little, curly red flakes, to which it owes its name. In general form, with its stiff wiry branches and thin foliage, it resembles the ordinary mulga (Fig. 29). The acacias differ in their form of growth to a wonderful extent, not only as between different species, but within the limits of the same species. For the most part the foliage of the mulga is dull olive-green, and its branches have a strong tendency either to diverge from a common base or to spread out fanwise, there seldom being any single main stem of any height. In the Desert Sandstone hill country, however, its

[1] Mulga is an aboriginal name either for *Acacia aneura* or for the shield made out of its wood. Giddea, gidgy, gidgee, with various other methods of spelling, is an aboriginal name for *Acacia homalophylla*.

Fig. 28. CASE MOTHS (p. 71).
1. Clania ignobilis. 2. Oiketicus elongatus. 3. Clania lewini.
4. Hyalarcta nigrescens. 5. Hyalarcta huebneri.

Fig. 29. MULGA SCRUB.

foliage was bluish-grey, and its branches grew out almost horizontally from a main central stem. *Acacia ulicina* forms little more than a good-sized shrub with scanty foliage and branchlets aborted into long sharp thorns. On the other hand, *Acacia salicina* may grow to a height of fifty feet and form a really graceful tree with foliage so thick that it actually affords a little shade. In most cases the leaves are more or less horizontal, but in one part of the country, amongst the Macdonnell Ranges, every tree of this species had its leaves arranged in such a drooping manner as to leave the boughs bare above and to produce a striking resemblance to a weeping willow.

Of bright colour there was very little. A pink convolvulus, a purple vetch, the bright yellow flowers of a Tribulus, and here and there clusters of white, purple or pink everlastings, were the only flowers to be seen, and they were not abundant enough to do more than emphasise the dulness of everything else. The Tribulus looks innocent and pretty enough when it is in flower, but later on, when the plant dries up and the seed cases are fully formed, it is a perpetual nuisance in the camp. Each case has three very sharp, curved spines which can penetrate the flesh easily and deeply. It is known as "three-cornered Jack" and, being very light, is scattered far and wide, and is always met with when least wanted. There are other species of plants with much the same kind of prickly seed cases. Some of the cassias, for example, have a pretty, downy centre, but, partly hidden by this and radiating through it, are a number of sharp little spines. In this part of the country, our camping place was often a bed of thorns, and, after selecting as clear a spot as possible, a usual preliminary to opening out our rugs was to sweep the ground with an impromptu broom of stiff cassia branches.

The most noticeable feature about the plants growing on the lower Steppes, is that many of them have become modified in one of two different ways in order to withstand the effects of the excessively dry climate. Some have their leaves or leaf stalks transformed into switch-like structures, others go to the opposite extreme and become thick-leaved and succulent. The most striking examples of the latter are species of Claytonia and Portulaca. They grow in little clumps, low down on the ground, and remain soft and juicy, like the leaves of a pig-face *Mesembryanthemum*, when everything else is dry and withered.

The lines of all river courses—which, it must be remembered, contain only scattered pools of water—are marked by belts of gum trees and acacias (Fig. 30). The number of the trees is often large, but that of the species very small. There are only two gum trees, *Eucalyptus rostrata*, the river gum, and *Eucalyptus microtheca*, the swamp gum. The former lives in and immediately upon the bed of the stream, the latter on land which is liable to periodic flooding. The only acacias which are really abundant in the scrub are the two popularly known as mulga and giddea, and of these only the former extends far north, the latter being confined to the Cretaceous formations of the lower Steppes.

The various species of Claytonia not only form a welcome vegetable diet so far as the leaves are concconcerned, but under the names of Munyeru and Parakilia, their little black seeds are gathered in large quantities by the natives. This share of the camp work is undertaken by the women, who collect the seed in their wooden bowls or pitchis. When ripe it is very easily winnowed, the simplest and most usual method

Fig. 30. BED OF THE FINKE RIVER WITH WATERHOLE AND BORDER OF GUM TREES.
The larger tree on the right side is *Eucalyptus rostrata*, the smaller is *E. microtheca*.

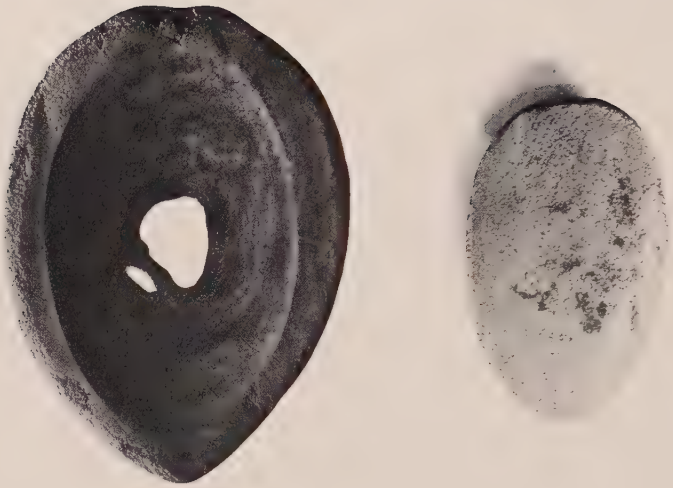


Fig. 31. NARDOO GRINDING STONES.

The larger, lower or nether stone, must be of great age. The floor of the depression made by the grinding has been reduced to a thin shell and then broken through.

Fig. 32. ARUNTA NATIVE USING GRINDING STONES.

being that of pouring the seed from one pitchi into another. Any puff of wind blows the husks away, the heavier little seeds falling into the pitchis. The grinding down is also a simple but rather tedious process. The woman squats on the ground. In front of her she has a flat stone, perhaps two feet in diameter and one or two inches thick. The upper surface, if it be an old grindstone, may have one large concavity, or two, or even more smaller ones, separated from each other according to the manner in which the stone has been used. These grindstones are evidently used for very long periods of time, and, as they are met with in many parts of the country where such slabs of stone are not procurable, they must often be traded over long distances. The larger ones are very heavy, and, when the owners move camp, are hidden away, either buried in the ground or stored in a crevice in the rocks. As a general rule only one side is used for grinding, but a specimen now in the Melbourne Museum has been used on both sides, with the result that the whole stone has been worn away at a part where the two grinding surfaces chanced to be opposite to one another (Fig. 31). When in use the larger or nether grinding stone is placed on the ground, the seeds are poured on to it, and then the grinder, holding a smaller rounded stone in one hand, grinds backwards and forwards, pouring a little water on to the stone until a dark, muddy-looking paste is formed (Fig. 32). This may be eaten at once, when it tastes like black mud, or, more often, it is shaped into a small cake and cooked in hot ashes, in which case it becomes as hard as a brick and needs the teeth of a blackfellow to grind it again. It is food of this kind which wears down the crowns of the teeth of the Australian savage, until, as is

so characteristic of their jaws, all the teeth have flat, level surfaces. In the really old people the teeth are worn down nearly to the gums.

Another very characteristic plant, especially in the region of the upland stony plains, is the salt bush. The foliage has a peculiar blue-grey tint very much like that of a sage plant, caused by the presence of a mealy secretion on the leaves, which is probably of use in checking too rapid evaporation. Its popular name is due to the fact that it contains a considerable amount of salt, which renders it most useful for fodder, and for this reason and also because of the recent severe droughts, it has become almost exterminated in parts where once it was abundant. There are several different kinds of salt bush,[1] but none of them grow to any large size ; most of them, in fact, are only little shrubs, but their light blue-grey colour gives a distinct character of its own to the well-known salt-bush plains of the interior of Australia. Sooner or later salt bushes will have to be planted in Australia as now they are in America.

Grasses, such as *Spinifex paradoxus*, grow in the form of tussocks, often of considerable size and always separated from one another so that the individual plants can be counted; indeed, except just for a short time, or in specially favoured places, where water happens to lie longer than elsewhere, it is always possible to count the plants. For a short space of time, directly after the rain has fallen, the ground is thickly covered with endless, bright green seedlings. The question of which are to survive and which are to perish is settled at a very early stage. Only

[1] "Salt bush" is a name given in Australia to species belonging to three distinct genera of plants, viz., Atriplex, Rhagodia and Kochia. Perhaps the best known one is *Atriplex nummularia*, the so-called "old man salt bush."

Fig. 33. DESERT OAK (*Casuarina decaisneana*).
The ground is dotted over with clumps of porcupine grass (*Triodia sp.*).

those that reach a certain size before the hot, dry season really sets in have any chance of surviving. The weaklings are rapidly killed out. There is no struggle, as between plant and plant, for room in which to live and grow: the real, hard struggle is against climatic conditions.

All over both the Lower and Higher Steppe lands the plants have become modified in one way or another. The acacias, without exception, have lost their true leaves and some of them are of the most thorny kind. Hakeas and Grevilleas are either thorny or have their leaves hard and leathery. The "desert oak" (Casuarina) has completely lost its leaves and its apparent, dull-green, drooping foliage is made of little stiff, green twigs (Fig. 33). On the other hand, we have the succulent Claytonias and Euphorbias, the one highly nutritious and the other equally poisonous.

It is customary to associate thorns and prickles with the supposed protection of the plant possessing them against some natural enemy in the form of an animal which is deterred from eating them because of the presence of these same thorns and prickles. So far as Central Australia is concerned, we are strongly inclined to think that protection against animals has nothing to do with the presence of prickles on so many plants. As a matter of fact none of these plants are in the least degree protected against camels by their thorns. A camel will munch away, apparently with equal relish, at the most prickly acacia, just as readily as it will feed on the juicy Claytonia. The prickly growths, the thorny seeds, the succulent and wiry leaves of various Central Australian plants are, one and all, adaptations to climatic conditions. The higher animals in Central Australia are, first of all, too few in number to affect the trees appreciably. The only animals which really do any damage are locusts and caterpillars, and no thorns hinder these. Again, amongst

the higher forms, the only leaf-eating animal that can climb is the opossum, and this lives on the gum-trees, which have no thorns or prickles. The influence of kangaroos and wallabies is limited to a height of, at most, five or six feet, and thorns and prickles are not.

Dr. Cockayne has shown clearly, in his experiments with New Zealand plants, that certain methods of growth, such as the prickly nature of many plants, are intimately associated with the climatic environment and have nothing whatever to do with protection against animals. In Central Australia what the plant requires is protection against too rapid evaporation, and this is achieved in various ways. That some of these should result in protecting the plant against animals is a secondary matter; the same result would have been brought about whether animals formed part of that plant's environment or whether they did not. The plants become, in one way or another, climate-proof, and if animals, such as camels, want to feed on them, they must undergo modification so as to be able, for example, to withstand the hard prickles. It is just in these hot, arid and often desert parts, where animals are most rare, that the most spiny and the most succulent plants are found.

On the other hand, there is the undoubted fact that thorns and prickles are well developed on plants that live in parts where there is an abundant water supply, and where the existence of such structures can only be accounted for on the supposition that they protect the plant against animals which, but for their presence, might injure it. In the case of these plants we always find that the leaves are well developed, whereas in all the thorny plants of dry regions, the leaves, if present at all, are dry and coriaceous. This would seem to imply that thorns and prickles may be developed, on the one hand, as the

Fig. 34. VALLEY OF THE FINKE RIVER AT CROWN POINT.
There is no surface water. The light colour of the river bed is due to sand.

direct result of the influence of climatic conditions, without any connection whatever with protection against living enemies; and, on the other, as a protection against animals, without any reference to climatic conditions.

From Charlotte Waters our course lay roughly north-west, parallel to the course of the Finke, which has hollowed out a broad, shallow valley cutting through the Desert Sandstone and the Cretaceous rocks beneath. Every now and then we passed long, flat-topped hills capped with a horizontal stratum, only a few feet thick, of the hard quartzite which forms the Desert Sandstone. From the top of any slight rise these isolated hills are the only objects seen that break the otherwise level line of mulga stretching away monotonously to the horizon. Two days after leaving Charlotte Waters we crossed the bed of the Goyder River—quite dry of course—and, turning slightly to the north, a few miles' ride brought us to the brow of a small escarpment forming here the southern boundary of the Finke valley, which, in this part of its course, runs almost due east and west. Away to the north we could see the wide gap where, at Crown Point, the river passes through the middle of a range of flat-topped hills (Fig. 34). The Desert Sandstone capping of the latter indicates here, as elsewhere, the former level of the land, and shows how great has been the denudation since early Tertiary times. A day later, after travelling along the southern side of the Finke valley, we camped at the base of a small cliff on the banks of the river. From the top of the little cliff, looking north we saw beneath us the wide bed of the river filled with white sand but without a drop of surface water. Its banks were defined, for the most part, by gum trees; first of all a fringe of red gum (*E. rostrata*) with their white

trunks shining brightly in the sunshine, and further away from the river, the swamp gums or box trees (*E. microtheca*) merging into the undulating sand hill country, covered with thin scrub and patches of dark mulga. Three miles to the north lay the gap where the river pierced the flat-topped hills, as they ran across from east to west. Close to the western bank an outlier, called from its shape Crown Point, stood out in strong relief against the sky, showing very clearly the level capping of Desert Sandstone and the softer and more friable sandstone underneath.

Immediately below us, on the western side of the main stream and a few feet above the level of the latter, was a broad flat covered with thin cassia scrub and dotted over every here and there with gum trees, remnants of those which once bordered the banks of the stream in this part, as they now did everywhere else, as far as the eye could reach. The little series of cliffs, on one of which we stood, was evidently made of material more resistant to denudation than that of the old land surface round them, with the result that the river, impinging on them in its southern course, had been turned off sharply to the east. This sharp turn in the bed of the river had, at some time or another, served to bank up a huge flood, sweeping down from the north through the broad gap at Crown Point, and the swirl and eddy of the waters had loosened the soil around the shallow roots of the gum trees, with the result that all but a very few of them had fallen and been swept away in the flood waters.

It was only fifty years ago since Stuart,[1] in his overland journey, first struck the river close to the spot on which we were standing, and named it the Finke in honour of one whom he describes as "my sincere and

[1] *Journals of John McDouall Stuart*, 1864, p. 149.

Fig. 35. YELLOW CLIFF.

The striated pebbles are found in the small formation that forms the top of the cliff.

tried friend and one of the liberal supporters of the different expeditions I have had the honour to lead." He evidently saw it during an exceptionally good season, as he says that there was plenty of water with "the finest gum trees we have yet seen." Save for the absence of water, the river, in fact the whole scene, must have been just the same as when Stuart first gazed upon it. The one thing which struck us most was the size of the sandy bed—in parts nearly a quarter of a mile across—and the entire absence of surface water. It was a river in name only, and yet it was quite evident that once—not very long ago, as time is measured geologically—there must have been a continuous flow of water, and that on a big scale, to form the great but now dry river-bed and the gorge through which it comes down from the north.

The little cliff, known from its colour as Yellow Cliff, is not more than fifty feet high, and is formed, for the most part, of soft and easily-weathered yellow sandstone with a slight dip (Fig. 35). It contains large pebbles, and seems to be identical in nature with the sandstone forming the main mass of Crown Point, though at the latter spot, three miles away, it has a dip of 73°, and is overlain by the capping of Desert Sandstone. There is none of the latter at the Yellow Cliff, but, in part, it is capped by a thin layer, not more than two or three feet thick, composed of quartzite pebbles, from an inch to a foot in diameter, embedded in a sandy matrix, and to this hard capping it owes its existence. On the Horn expedition, when we were returning southwards from Alice Springs, we noticed, a little to the north of Crown Point, a small but curious formation, of which Mr. Watt, the geologist of the expedition, wrote in his field note-book: "Before reaching Crown Point a peculiar structure is seen in the small yellow and white kaolinised sandstone hills, the

structure simulating contortion, and probably due to settling of partially consolidated material owing to the melting of ice." This formation was about five miles north of the Yellow Cliff. Sundry pebbles, which had weathered out of the latter, showed suspicious-looking striations, but, unfortunately, none were collected during the Horn expedition, and the question was not referred to in the geological report. Feeling sure that there was unmistakable evidence of glaciation in this part of Central Australia, one of us again visited the spot two years later, this time in the company of Mr. P. M. Byrne, the officer in charge of the Charlotte Waters Telegraph Station. We found that, without any doubt, there were striated stones (Fig. 36), and that they were weathered out of the thin formation capping the sandstone. There were plenty of stones embedded in the latter, but they were all rounded, without a trace of grooving or grinding down. Messrs. Tate and Watt stated that the pebbles in the sandstone were Desert Sandstone and quartzite. We went on to Crown Point and there found that the sandstone underlying the capping of Desert Sandstone appeared to be identical with that at Yellow Cliff, and contained numbers of pebbles also, apparently indistinguishable from those at the Cliff. If this be so, it follows that the pebbles in the sandstone at the Yellow Cliff are not derived from Desert Sandstone; that in fact they are embedded in a rock older than the latter. Professor David,[1] to whom we submitted our material for examination, inclines to the opinion that, slender though the evidence is, on the whole it is in favour of a time as far back as the Permo-carboniferous age for the glaciation in Central Australia. On the other hand, if the sandstone at Yellow Cliff be of the same age as that at Crown Point, then, granting that the determina-

[1] For an account of this see *Proc. Aust. Assoc. Adv. Sci.*, Vol. VII., p. 109.

Fig. 36. STRIATED STONES, FROM YELLOW CLIFF.

tion of the latter as Cretaceous be correct, it is evident that the glaciation must have taken place in post-Cretaceous or, at earliest, late Cretaceous times. This locality, lying as it does in, approximately, Lat. 26° S., revealed the existence of glaciation at a spot considerably nearer to the equator than it had ever been shown to exist in Australia before.[1] Whether it points to the extension of the southern ice cap so far to the north is a matter of great doubt. We have already referred, more than once, to the relatively enormous size of the river channels and to the vast amount of denudation which in times past has taken place in this part of the country. Since post-Cretaceous times the whole of the area covered by Desert Sandstone and the underlying Cretaceous rocks has been denuded to a depth of at least two hundred feet. The large empty watercourses now meander over the thinly scrub-covered plains, but there must once have been a time when there was, not far away, a great gathering ground of water. This was undoubtedly associated with what was then a chain of lofty mountains, running east and west across the Centre, and now represented by its denuded remnant in the form of the Macdonnell Ranges. It may be that at Crown Point we have a trace left of some glacier which once descended on to the southern plains from the snow-clad peaks of these central ranges.

At Crown Point we left the valley of the Finke, travelling some miles to the west of it for three days, over the usual open, thinly scrubbed country, with flat-topped hills every here and there, until we again struck

[1] Four years later, in 1900, Mr. Gibb Maitland made the important discovery of the existence of a large deposit of glacial origin in West Australia. This deposit, which occurs in the Gascoyne district in Lat. 23½ S., and is regarded as Permo-carboniferous in age, has since been shown to extend over two hundred miles of country.

the river at a place called Engurdina, or Horse Shoe Bend, where the river sweeps round in a great curve from north-west to south-east—hence the appropriate local name.

On the tableland above the river valley, which was here bounded on the north and east by precipitous cliffs about three hundred feet high, at the base of which the river itself flows, there were several curious heaps of stones which had evidently attracted the attention of the natives, who had piled them carefully together and kept them clear of weeds. Tradition relates that, in the Alcheringa,[1] a grass-seed woman lived here. She had a son, and the men of Engurdina decided to take him away to a distant place called Urapuntja—the hill of fire—in the western Macdonnell Ranges, to perform the ceremony of initiation there. Now the boy was fair in colour, and the men of Urapuntja took a great fancy to him, and determined to try and keep him. After much talk they persuaded the Engurdina men to leave him behind and take with them one of their youths in exchange. The mother was constantly on the look-out for their return, and at last she saw them coming back over the sand-hills. Even far away she knew that the youth was not her son, and was very angry. According to custom she went out to meet them, carrying water for them to drink. Into the water she had put some "arungquiltha," that is, evil magic, though of course the men knew nothing of this, and drank it all up with the result that they at once became very ill, vomiting forth all their insides, and so died miserably. The heaps of stones now represent what they brought forth. The boy did not die at once, but crawled away on hands and knees down to the river

[1] This is the name used by the natives when speaking of the far past time during which their mythic ancestors lived.

valley and died there, a stone arising to mark the spot. A fire, lighted at this stone, has the effect of making the sand so hot that it is uncomfortable to walk on, and in this way it is easy to annoy your enemies, because the fire will pass out of the stone and can travel long distances. On the other hand, fires lighted on the larger heaps of stone make it comfortably warm in cold weather. The old woman lived on alone, and being strong in magic, the stone, which arose to mark her burial place, is now full of evil magic, which can be sent forth into the body of anyone whom it is desired to harm by merely rubbing it and muttering requests to the magic to go forth. There are very many such objects associated with magic. Not far from Charlotte Waters, for example, there is an old gum tree called "apera akiltja," which means blind tree. It is so called because, in the Alcheringa, a celebrated blind man died at this spot, the tree arising to mark the place. It is therefore supposed to be full of evil magic associated with blindness, and the natives are afraid that if it were cut down the magic would come out, in fact be let loose, and cause everyone for miles around to become blind. By rubbing the tree and at the same time muttering certain incantations, they can cause some of the evil magic to go out and enter the body of any enemy whom they desire to blind.

From Engurdina we made a slight detour, crossing the river on to its northern bank and then travelling on over the sand-hills in order to see a remarkable natural feature, to which the explorer Stuart originally gave the name of Chamber's Pillar. These sand-hills are a very striking feature in this part of the country, extending with great regularity in their formation over two or three hundred miles from east to west. They vary in height from twenty to forty feet and run in long rolling lines from

north-east to south-west. Owing to the prevalence, during a considerable part of the year, of strong south-east winds each has a gently sloping southern and a steep northern face. On the south side they are covered with thin scrub, but on the north each has a long, bare, smooth line of yellow or red sand, where the slope is so steep that no vegetation can grow. It is slow and monotonous work climbing over these hills, which look just like enormous waves of sand rolling along one behind the other. Our course lay nearly at right angles to their length and in nine miles' travelling we crossed thirty-five of them, until at last we came on to a small stretch of level country with the Pillar standing in the middle of it, and a hill, curiously weathered in such a way as to resemble the turrets of an old battered castle, a little distance to the north. Chamber's Pillar has the form of a tall column rising from a broad pedestal about three hundred yards in circumference and one hundred feet in height (Fig. 37). The column itself rises seventy feet higher and is oblong in section, one side measuring about twenty-five and the other fifteen yards in length. It is composed of a friable sandstone, pale cream below and bright red above, capped by a thin layer, only a few feet thick, of hard Desert Sandstone which has protected the underlying softer rock from denudation. It is completely isolated and, standing out against the blue sky, the yellow sand-hills, and dull green mulga scrub, forms a striking object in the otherwise dreary and monotonous landscape.

The column has naturally attracted the attention of the natives, who account for it by saying that in the far-away times, the Alcheringa, there lived a great fighting man who journeyed away to the east killing all the men whom he met with his stone knife and taking all their women

Fig. 37. CHAMBER'S PILLAR.

captive. One night on his way back he camped at this spot, and as a result of his evil deeds he and the women were all turned into stone, which seems rather hard lines on the women, who had done nothing except be captured. Chamber's Pillar represents the man's body and the numerous little turrets of Castle Rock those of the women.

A little to the north of Horse Shoe Bend the Hugh River flows into the Finke on the eastern side, both rivers in this part of the country pursuing a very serpentine course, the mean rate of fall being less than two feet per mile. The course of the Finke between Crown Point and Horse Shoe Bend is roughly north; from the point of junction of the Hugh, following up stream, its general course for some time is nearly due east and west with many minor twists and turns. From a point about forty miles in a direct line to the west of the Bend to the place at which it emerges from the Ranges, its course is from south-east to north-west roughly parallel to that of the Hugh. Amongst the Central Ranges the course of each stream is almost due north and south. Their head-waters, situated in a jumble of low hills to the north of the main Ranges, are not more than fifty miles apart.

The main track to Alice Springs leaves the valley of the Finke at the Bend, following the telegraph line north until the Hugh valley is reached. The line follows the river, the track crossing and recrossing the sandy bed time after time, as the river meanders over the level country. Still following the river, it crosses the southern ranges, here known as the Waterhouse, almost at right angles to their course, and then takes a sudden turn to the east, so as to avoid passing across the loftier part of

the north Macdonnells, until at length it reaches Alice Springs, which lies in the heart of the Ranges. At Alice Springs it again turns north and runs over the hills at a spot at which they are comparatively low. From the point at which the telegraph line strikes the Hugh there is an alternative, and shorter, track which runs almost straight north, crosses a depression in the Ooraminna Range, and then reaches Alice Springs by way of a gorge, through which the Todd River flows out to the south. This is the one generally taken at the present day, the only difficulty, apart from the very heavy sand-hills encountered near the Bend, being the short, steep ascent, locally known as "the Pinch," where the track crosses the Ooraminna Range.

On the occasion of the Horn Expedition we left both these tracks to the east and followed up the main Finke River for five days, at the end of which time we reached a place called Henbury—a far outlying cattle-run, in charge of two white men. This particular spot was chosen because there happens to be a deep waterhole in the river-bed just here. This is a good example of one special kind of water-pool found along the course of rivers such as the Finke. It owes its existence to the presence of a bar of hard rock running across the river bed. When the floods come down, an eddy is formed on the upper side of the rock, where the water strikes against the bar, with the result that the sand is scooped out and a deep pool formed. The only trouble with this kind of waterhole is that, if only a moderate rainfall occurs, then the current is not strong and, instead of the hole being scooped out afresh, the particles of mud and sand which the water carries are liable to be deposited, and so what is one year a deep and apparently permanent waterhole, may be a dry

patch next season. There is, however, one consolation, that, in such a place as this, water can always be obtained by sinking to a slight depth.

At Henbury we were camped close to the southern outliers of the James Ranges. The hills, instead of being flat-topped, were rugged and irregular in outline. We were in fact passing across the northern margin of what was, in times past, a great inland Cretaceous sea which once spread over a large part of the interior of the continent. The waters of this inland sea must have washed up against the southern base of the James Range,[1] from which rivers poured down laden with detritus derived from the denudation of the then lofty ranges of which the James formed only the southern ridge. In this sea there was deposited the formation, some fifteen hundred feet in thickness, which now forms the greater part of the surface of the southern Steppes. In the region of Lake Eyre, far to the south of the Macdonnell Range, and to the west of the coastal ranges of Queensland and New South Wales, bores sunk for the purpose of obtaining artesian water show that the formation is composed of shales and clays. Passing north these are gradually replaced by sandstone. In other words, of the material brought down by the rivers from the old central ranges, the coarser grains were deposited nearer to the shore line of the sea, the finer particles being carried farther away.

In many parts the Cretaceous formation appears to be

[1] The name James Range may with advantage be applied to include the succession of ridges which now form the southern part of the elevated Central area of the continent. All these ridges dip down beneath the northern margin of the Cretaceous formation and, from west to east, are known under the following names: George Gill, Levi, Krichauff, Waterhouse, and Ooraminna Ranges.

conformable with the overlying Desert Sandstone, but in others, as at Crown Point, it certainly is not.[1] Here, as usual, the Desert Sandstone is horizontal, but the underlying Cretaceous formation dips at a high angle. After the deposition of the latter there must have been a period of elevation and at least local disturbance, accompanied, presumably, by denudation to a certain extent. This was followed by the deposition of the Desert Sandstone, the characteristic feature of which, in Central Australia, is the large amount of silicification which it has undergone.[2] There are parts where the Cretaceous Sandstone is silicified, but in these places there is no capping of Desert Sandstone. This seems clearly to establish two facts (1) that after the formation of the Desert Sandstone denudation of the latter took place, at all events in parts, and (2) that the actual silicification took place after such denudation, because unless this were so the Cretaceous formations not overlain by Desert Sandstone would not be silicified.

Over parts of Central Australia obsidian bombs and agates are met with, lying on the surface of the ground, some of the former being very perfect in form, others showing clearly the grinding power of wind-borne sand. Messrs. Tate and Watt suggest that these indicate the former existence of volcanic action in this area. They say "The obsidian bombs demand volcanic action, and agates are not infrequently associated with volcanic ejectamenta; whilst the silicates of the ash beds or lava under chemical action would furnish silicated waters as a

[1] In the *Horn Expedition Report*, Geology, Part III., p. 65, Messrs. Tate and Watt say: "No evidence of unconformability between upper Cretaceous and Desert Sandstone was observable between Oodnadatta and the northern confines of the Cretaceous area." I cannot help thinking that there is some mistake here, as at Crown Point the unconformability appeared to me, on a subsequent visit, to be most marked.—(W. B. S.)

[2] *Horn Expedition Report*, Geology, pp. 69 and 70.

Fig. 38. OBSIDIAN BOMB.

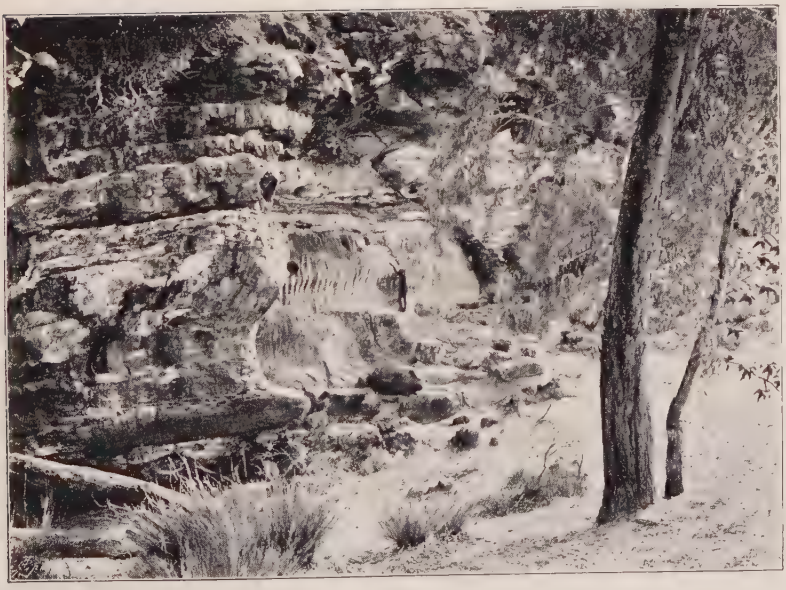


Fig. 39. UNDIARA.

The ledge of rock with stripes is the *Nanja* of a kangaroo, and the dark colour above the stripes is blood, which has been poured on to the rock during the ceremony.

source of the chalcedonising action on the underlying rock-surfaces. The development of agates within the volcanic material was only another phase of siliceous precipitation."

In reference to this it must be pointed out that it is not by any means universally held that obsidian bombs demand volcanic action.[1] Some authorities are inclined to regard them as being very likely extra-terrestrial in origin. Their origin is certainly a difficult problem to solve. They consist of a brownish or greenish coloured vitreous material and, in perfect specimens of the simplest kind, there is a central spherical mass with a flattened rim running round the centre, as in the one represented in Fig. 38. The shape of these obsidian bombs is just that which would be assumed by a small mass of molten vitreous material falling through the air and rotating as it fell.

About fifteen miles to the east of Henbury there is a small shallow cave, or rather a recess hollowed out of the rocks, at the base of a range of hills not more than three hundred feet high. Close to one side of it is a waterhole sheltered by a gum tree (Fig. 39). Above the pool the rocks rise perpendicularly for fifty feet. A level ledge extends back from the top of the rocks for a short distance, and behind this again rise the bare summits of the range. In rain seasons the water gathers in a pool on the ledge and then tumbles in a small cascade into the one below, from which a small gum creek meanders away but is soon lost in the dry country that stretches away to the south.

This spot, known to the natives as Undiara or Antiarra,

[1] The best and most comprehensive account of the occurrence of obsidian bombs in Australia is given by Mr. R. H. Walcott in *Proc. Royal Soc. Victoria*, Vol. XI, 1898.

is the centre of a large kangaroo totem group, and with it many traditions of past times are associated. On the ledge the ancient ancestors lighted their camp fires in the Alcheringa, when they performed the Engwura ceremony, and therefore it is spoken of as the Mira Engwura, or Engwura camp.[1] Close by are a number of small dark stones. Tradition says that in the Alcheringa a kangaroo man named Ungutnika lived here. He was sorely afflicted with boils. For long he bore with them, but at last he got angry, pulled them all out, and placed them on the ground beside him. They changed into the stones, and there they have remained ever since. When any native now wants to afflict an enemy with boils, all that he has to do is to come to this place and perform a certain ceremony. He makes a few small toy spears and throws them at the stones. Some of the evil magic from the latter enters the spears, which are then thrown from the point of a spear-thrower in the direction of the man whom he desires to injure. The evil magic goes out from them and enters the body of the victim, who soon develops boils.

This same Ungutnika, who was half a man and half a kangaroo—or, to express the matter still more correctly, a kangaroo with human and also superhuman powers—started away from Undiara to travel northwards. In the case of Alcheringa ancestors such as Ungutnika it is often difficult to say exactly whether they were animals or human beings; sometimes it is the first, and at other times the second aspect of their twofold nature which stands out most clearly. During his travels Ungutnika

[1] "Engwura" is the name given to a long series of ceremonies through which all the men must pass before they are regarded as fully developed members of the tribe. They include certain fire ceremonies. "Ura" is the Arunta word for fire, "mira" is the native term for a camping ground.

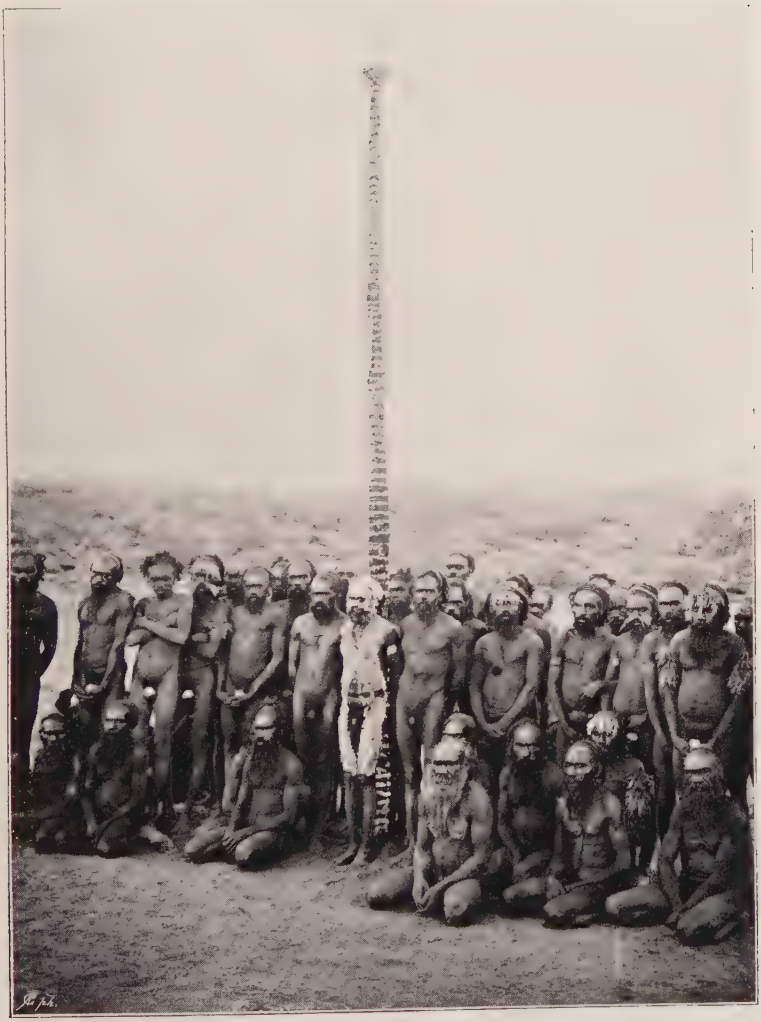


Fig. 40. KANGAROO CEREMONY AT UNDIARA.

came to a small plain and saw a number of wild dogs, around whom he hopped. The dogs saw him and gave chase, and, though he hopped away as hard as ever he could, they caught him, tore him open, ate his liver, and, throwing the skin on one side, stripped all the meat off his bones. They then lay down to rest. Ungutnika was not, however, by any means done for. His skin and bones remained, and in front of the dogs and much to their surprise, the skin came and covered the bones, and away he hopped followed by the dogs. Three times more they caught him and three times more he came to life again. Finally, still chased by the dogs, he ran in to Undiara and was, for the last time, killed and eaten by the side of the waterhole there. The dogs cut off his tail and buried it separately at a spot where it still persists in the form of a stone called "Churinga okira pura" or Churinga kangaroo tail. Though there was nothing on the surface to indicate its position, the native who was with us when we visited Undiara went straight to the place, and, after digging down for about a foot unearthed it. It is merely a block of soft grey sandstone, about three feet long and one foot broad. In section it is triangular, with two of its faces worn perfectly smooth by constant rubbing. Close by a large number of irregular blocks of stone represent the bodies of the wild dogs. During the Engwura ceremony which we subsequently saw enacted at Alice Springs, we saw several sacred ceremonies representing episodes in the life of this great kangaroo ancestor who lived at Undiara (Fig. 40).

The recess itself, or rather a rock platform which runs across its lower part, is, however, the central object of interest at Undiara. It has a length of nearly twenty yards and a height of ten feet. The ground slopes

somewhat steeply up to its base, and, at the western end, a series of rough steps, partly natural and partly artificial, lead on to the upper surface of the platform. The figure of the native in the illustration will serve to indicate the actual size of the rock. Its vertical face is coloured with alternate stripes of red ochre and white gypsum. The upper surface is dark, almost black in parts, with dried blood which has also trickled over the edge and down the face.[1]

Everything around and at Undiara has some tradition associated with it. According to one, a large kangaroo was wandering over the country near to Undiara, in the Alcheringa. It carried a small sacred pole called a Nurtunja, and was seen by a wallaby man who turned into a kangaroo man and gave chase. On and on the two went. At one spot the kangaroo stood and looked round to see where his pursuer was. Here a tall column of stone arose to mark the place, and it can still be seen. Being very tired it planted the Nurtunja in the ground, and a large gum tree, now called Apera Nurtunja, arose there at once. After a long chase the old kangaroo man from Undiara saw some other natives who also had come from Undiara, and together they all attacked the kangaroo. It was very strong and tossed them about in all directions. The original pursuer was killed because he had the bad luck to get pushed underneath when, all together, they made a jump on to the animal's back. At length it was overcome and they dragged the body in to Undiara and placed it in the cave where it died, the platform of rock arising to mark

[1] The first description of Undiara was given by Dr. Stirling, *Horn Expedition Report*, p. 67. A full description of the spot with its associated ceremonies and traditions is given in *Native Tribes of Central Australia*, pp. 193–201.

the place. Into this rock its spirit passed, and later on a number of other kangaroos (animals in this case, not human beings) came and died here, their spirit parts also going into the rock.

At the present day, when the natives wish to increase the number of kangaroos, they come to this rock and perform certain ceremonies. After decorating the face afresh with white and red stripes, the red representing the fur of the animal and the white the bones, a number of the younger men climb on to the top of the rock. There, to the accompaniment of chants sung by the other men who are grouped below on the ground, they open veins in their arms and allow the blood to stream out on to the top of the rock, whence it trickles down over the decorated face. This is supposed to make the spirit kangaroos which live in the rock go out and give rise to real kangaroos, which of course the natives can spear and eat, though curiously enough the kangaroo men themselves do not do so or at most only very sparingly.

Our camp at Henbury was close to the base of the James Range, and here ended our traverse of the Lower Steppes with their monotonous, scrub-covered plains, whose level outline was only broken every now and then by low, terraced hills, capped with Desert Sandstone so hard and inhospitable that no vegetation could obtain a footing on it. In ancient times, before the exposure of the lower, softer sandstone had provided a loam in which, at least, hardy plants could grow, and when the whole surface of the Cretaceous area, stretching right away eastward to New South Wales and Queensland, had just risen from the sea and presented an almost level sheet of the hard, silicified rock that we now call Desert Sandstone, the solitude and silence on these Lower Steppe lands

must have been absolutely appalling. In post-Cretaceous times the weathering away of the hard, surface rock, accompanied by a pluvial period, transformed this central part of the continent into a rich lacustrine area, covered with luxuriant vegetation and inhabited by giant birds and marsupials, now extinct, with crocodiles, chelonians and fishes now only found in the northern tropical parts of Australia. Later on, a period of desiccation supervened which has persisted to the present day, its most extreme effects being seen in the country that centres in Lakes Eyre and Amadeus.

Whether this desiccation is now increasing or diminishing in intensity it is impossible to say. Should the former be the case and should it continue, then in years to come the central Steppe lands will pass into the condition of a desert. As yet, however, except during occasional severe droughts, they are far removed from being anything of the kind, and all that is needed to transform the greater part of the Centre into a valuable territory is firstly some scheme of water conservation on a large scale, and secondly adequate means of communication with the coastal districts.

We had been travelling slowly for more than three weeks over the plains and it was quite a relief to be away from them, and their limitless expanses, for a time and to find our view hedged in by the great, red, rugged masses into which the Ordovician rocks of the James Range had weathered. Later on we will return to a description of this Range Country which forms the Higher Steppe lands of the interior. For six days after leaving Henbury we travelled westwards ; and then, from close to the western end of the George Gill Range, where the hills dip down under the great plain that stretches across to West Australia, we turned southwards into the desert region around Lake Amadeus.

CHAPTER VI

THE DESERT REGION OF LAKE AMADEUS

The southern margin of the George Gill Range presented a series of bold, picturesque headlands, formed of a hard Silurian sandstone, which sheltered little rocky pools, margined by reeds and ferns and overhung by gum trees, while every now and then tiny streams actually trickled down the gorges amongst the hills. Out among the sand-hills everything was as dry and sterile as possible, and the contrast between them and the almost verdant foliage immediately around the rock pools was most striking. Within actually the space of a few yards, we could pass from desert country into a luxuriant growth of reeds, ferns, and flowering shrubs. Around the margins of the pools species of Adiantum, Cheilanthes, and Aspidium formed quite a carpet of green; amongst the larger plants, pines, fig trees, Tecomas, and a yellow-flowering Hibbertia were growing freely. The surface of the water was flecked with the floating leaves of Vallisneria and Potamogeton, and yet within ten yards of the margin of the pool was sterile desert country stretching away southwards to the sea without a break. From the sides of the water-pool, the rocks rose precipitously, and over them in the rain season water must pour down in torrents from the hills behind. After travelling for weary weeks across arid plains, and amongst bare and

rocky ranges, it was quite refreshing to camp for a while in the midst of foliage which was really thick and green, and we have often regretted that we could not spend a longer time amongst these gorges on the southern slopes of the George Gill Range. The natives evidently appreciated them as much as we did. Wherever there was a flat rock surface there we found traces of them in the nature of quaint drawings, done in red and yellow ochre, charcoal and white pipeclay. One of them especially attracted our attention. Crude though it was, it showed considerable ingenuity and a certain amount of imaginative capacity on the part of the artist, and, when its meaning was explained, we could readily enter into his feelings. This particular drawing was done in black and white, and was meant to represent a view, seen from beneath, of an emu sitting upon its eggs (Plate II., Fig. 8). The eggs were there—oval-shaped masses of black charcoal, outlined with pipeclay; the legs, with the three characteristic toes, were strongly outlined, as was also the tail, which was rather exaggerated. The breast of the bird was indicated by a series of white lines, while a large number of "broad arrows" indicated the tracks of the bird walking about the nest. The fact that the eggs were laid at different times, and that therefore some of them were more advanced than others, was probably intended to be shown by the different sizes of the eggs, as drawn on the rock. Other drawings represented animal forms, done most crudely, and some were what may be called geometrical in nature, consisting of concentric circles, curved lines, and dots.

We camped for a day or two by the side of a water-pool called Reedy Creek, which lay in a roughly semicircular hollow in the Ranges, open to the south and shut in on the north by precipitous cliffs of red sandstone. Climbing

up the hill-sides we could see the ranges running away east and west with bold bluffs rising one behind the other, as if they were a series of sentinels posted to prevent the encroachment northwards of the desolate, desert country upon which they looked out to the south. The creeks which run out from the ranges, though their beds were quite dry, could be traced for a few miles with their fringe of gum trees but, beyond this all was parched and arid, and it is only within a short time of the fall of rain that, away from the hills, they contain any water. Ages ago, when the Ranges were much higher than they are now, these streams would be proportionately larger, and doubtless formed the tributaries of a river which emptied its waters into Lake Amadeus ; but with the wearing away of the mountains and the gradual desiccation of the Central area, they have dwindled and dwindled until now they are mere vestiges and, instead of uniting, each runs out for a very few miles on to the sandy flats and is soon lost. While camped here we had a good opportunity of seeing the remarkable tracking powers of the natives. We were out in the scrub with three of them, in search of animals, when suddenly they came to a stop and began to examine the ground carefully. We could see no special reason why they should be so excited and interested as they were, but when we asked them what was the matter, they told us that there was an old emu with young ones not very far away. Accordingly the three separated, so as to cover as large a space of ground as possible, and off they started, at a pace which made it quite difficult enough for us, carrying some collecting apparatus, to keep up with them, without bothering to look for tracks which were only visible, on that hard ground, to the trained eye of a savage. The men kept talking to one another in gesture language, and after about two miles they came to a sudden halt;

and there, in an open patch in front of us, was the mother emu with six young ones. The natives had left their spears in camp, and so the mother, who made off at once, escaped, but, laughing and shouting like boys, the men chased and soon caught the young ones. We carried them back to camp with us, and took them on for some hundreds of miles on camel-back.

In order to secure most of the smaller animals the help of the natives is indispensable. Many of them are nocturnal, or, if not strictly so, they come out only towards evening, but the natives know exactly where to find their burrows. On the hard, sandy flats skirting the range we found an abundance of mice and Jerboa rats. The body of the latter is about the size of an ordinary rat, but it has developed curiously long hind legs and hops along just like a diminutive kangaroo. Both the mice and the rats make a hole in the ground, just big enough to admit the body. From this the burrow goes slanting down for at most three or four feet, often only a foot or two, and ends in a little chamber with a small amount of dried grass on which the animals, with their young ones, rest during the day. In the burrows of the mice (*Mus gouldi*) we always found more than one adult, with usually broods of four young ones. The Jerboas (*Conilurus mitchelli*) seemed to live alone, and, in this case, there were the same number of young ones, with often two broods of different ages in the same burrow. The mice are just as plentiful as the Jerboa rats.

Side by side with the Jerboas there is found the little marsupial called Antechinomys, which also has long hind legs. Mr. Lydekker,[1] when dealing with Antechinomys, says: "this saltatory mode of progression having been doubtless developed in accordance with the exigencies of

[1] "Marsupials and Monotremes," *Allen's Nat. Hist. Library*, p. 181.

the arid country inhabited alike by Antechinomys and Hapalotis (Conilurus)." In the first place, the running mouse and the jumping Jerboa live side by side, both of them flourishing in the same arid, sandy country, the one thriving just as well as the other. Watching the animals in their natural surroundings, it is difficult to understand exactly what is the advantage gained by a small animal, such as a rat, from this jumping mode of progression. In the case of a larger animal, such as a kangaroo, whose chief enemies are savages and wild dogs, it is doubtless an advantage to be able to go straight ahead, instead of having to dodge round tussocks of tall grass and low shrubs, as its pursuers must. The little Jerboa rat is, however, far too small to jump over any but very low obstacles. The chief enemies of rats and mice in these parts are birds of prey, and, what is of the greatest advantage to the former is the capacity to gain the shelter of a tussock of grass or a shrub as rapidly as possible. A running animal can do this just as quickly as a jumper, possibly even a little better, as the run into shelter is a continuous one, whereas, when a Jerboa has made its final leap, there must be just a momentary pause before it starts to run, because only rarely can it actually jump into shelter. A very slight difference in time, when a hawk or an owl is in pursuit, means the loss or saving of the animal's life, and probably the real advantage of the jumping method of progression amongst the smaller animals lies in the difficulty that birds experience in pouncing down upon an animal which is proceeding by leaps and bounds. It has certainly nothing to do directly with the sandy and arid nature of the country.

As compared with the rodents which are indigenous to the country, the marsupials must be at some considerable disadvantage. While they are travelling, it is not easy to

distinguish in colour, size, and mode of progression a small Jerboa from an Antechinomys. They live in the same kind of country. The latter, which is very rare, is mainly insectivorous, but the former, which is met with in hundreds, is mainly herbivorous. In one respect a marsupial is always at a great disadvantage as compared with a rodent. Not only has it to carry the young ones in its pouch, and there may be as many as twelve of these, the weight of which is a serious handicap when it is pursued by an enemy ; but, in addition, if the mother loses her life the young ones also perish, and that at an age when, in the case of a rodent, they would be able to take care of themselves.

At Reedy Creek our party on the Horn expedition divided into two. The main camp, with all the camel team and stores, went westwards along the base of the Range, while three of us under the guidance of our friend Mr. E. C. Cowle, with whom one of us again, at a later time, traversed the Macdonnell Ranges, made a flying trip to the south across the desert country, with the object of seeing Lake Amadeus and two remarkable rock masses known as Ayers Rock and Mt. Olga. As our time was limited we decided to travel on horseback and to trust to luck in the matter of water. Camels would, of course, have relieved us of any anxiety on this score, but they travelled too slowly to enable us to do what we wanted in the very short time at our disposal.

The camel team moved westwards out of camp at Reedy Creek early on the morning of June 16th, and a few hours later, so as to give the horses the chance of a good drink, as it was quite uncertain where and when they would get their next, we started southwards. After travelling sixteen miles we crossed the end of King Creek. The bed of the stream after it left the hills was very ill defined ; in fact it was only marked at all in many parts

by an irregular line of red gum trees which grew fewer and fewer, until finally they disappeared and we found ourselves amongst a series of low sand-hills, and camped for the night on a remarkably hard clay-pan which, however, as our guide pointed out, had the advantage of being clean. The ground was so hard that we were up early and breakfasted by starlight. Just at sunrise the black boy brought our horses in and we started off at once. From a scenic point of view the country was just as uninteresting as it could possibly be. There was a constant succession of sand-hills with intervening flats of more or less hard ground. On the sand-hills we were surprised to find, here and there, well-grown gum trees. Each of them reached a height of from sixty to eighty feet. The trunk was silver-grey in colour, except the butt, where it was covered with a paper-like bark which peeled off in long yellow-brown scales. The foliage formed a kind of umbrella-shaped mass. We were astonished to find a tree of this size able to grow and apparently to thrive amongst the almost waterless sand-hills, more especially as a gum tree does not throw its roots down to any very great depth, and the surface soil, down at all events to the depth to which the roots of an ordinary gum tree penetrate, must be almost perfectly dry, except at rare intervals of time, in this part of the country. There were only, comparatively, a few of these trees and we did not see any young ones, though the hard seed cases were lying about on the ground in considerable numbers. It is probable that only during very exceptional seasons, or even a succession of such, is there sufficient moisture to allow both of the seeds germinating and of the young plant growing to such a size that it can take firm root in the ground before it is withered by the intense heat.[1]

[1] Identified by Prof. Tate as *Eucalyptus eudesmoides*. F.v.M.

On these sand-hills we met also with a plant which is very well known, at least by repute, in the centre of Australia. It only grows in certain parts, but it is traded, or rather its dried leaves are, far and wide. Scientifically it is known as *Duboisia Hopwoodii*, popularly as the Pitcheri plant, which is presumably its native name in some part of Australia. The natives use it both as a narcotic and as a means of catching emus. The plant has the form of a small stiff shrub with a number of straight stems from four to six feet high. The leaves are stiff and narrow. They are gathered by the natives and packed tightly into bags made of woven fur string. These bags are traded for many hundred miles, right away north into the central parts of Queensland and New South Wales, shields, carved boomerangs, spears and other articles being received in return for them. Whatever may be the faults of the Australian aborigine he is perfectly honest and trustworthy in regard to matters of trading. A native will hand over his bag of Pitcheri to another man who acts as intermediary, with the most perfect confidence that, sooner or later, he will receive its full worth in kind.

The simplest way of using the leaves is that of rolling a few of them together and then sucking them ; but the ordinary plan is to dry them by heat, cut them up finely and mix them with ashes obtained by burning the leaves of a species of cassia or acacia. The mixture thus produced is made into a small plug and chewed, or rather sucked. When not in use it is securely tucked away amongst the well-greased ringlets above the ear. If you put your hand up to your mouth and pretend to suck something, a blackfellow at once knows what you mean and, in the most friendly manner possible, will offer you his plug for a "chew."

Fig. 41. PORCUPINE GRASS (p. 110).

Fig. 42. LAKE AMADEUS FROM ITS SOUTHERN SHORE.
The whiteness of the lake is due to salt. There is no surface water.

In this part of the country the leaves are pounded up in water, and the decoction thus made is placed in a wooden vessel out in the scrub where an emu is likely to come across it ; or, more often, it is put into a water pool which is frequented by the bird. After drinking the Pitcheri water the bird is said to become stupefied ; or, to use the expressive description given to us by a native who was describing its action, the bird becomes " drunk, all same white man " and then falls an easy prey to the blackfellow's spear.

About forty miles south of the George Gill Range and to the north of Lake Amadeus, there is a low range called Winnall's Ridge, forming the southernmost outlier of the Ordovician formation—the same rocks that form the main mass of the James Range. Immediately after rounding the extreme eastern end of the Ridge, out amongst the dry and barren sand-hills, we came across a little flat on which a patch of Ti tree was growing. The presence of this shrub (*Leptospermum sp.*) is generally an indication of the existence of water, either on the surface or soaking through the ground ; and in the middle of the Ti tree we found a curious " native well," as it is called—that is, a little spring used by the natives as a water supply when travelling over this dry and otherwise inhospitable country. The native name for it is Unterpata. Here, in about the very last part of the land where one would expect to find water, there were the remains of what had evidently once been a mound spring. In the midst of a deposit of travertine limestone there was a natural well about fourteen feet deep. At the top it was about ten feet across; its walls slanted down steeply until at the bottom, where lay a pool of water, it was not more than four or five feet in diameter. At one time, just as in the case of the springs near Lake

Eyre, there was doubtless a mound with a spring at the top, but now the underground supply is so small that it does not reach the surface, and as desiccation continues the supply will disappear altogether. We came to the margin of the well, hoping, rather against our fears, that we should be able to get a little water for ourselves and, still more important, for the horses; but, to our disappointment, we found it simply putrid with the decomposing bodies of five, dead, wild dogs who had ventured into it in search of a drink and had been too weak to clamber out up the steep sides. The only thing we could do was to drag the carcases out and trust that it might be a little better on our return. In the case of a smaller well the natives usually cover the entrance with bushes so as to keep the dogs out, but the opening of this was too wide to allow of this being efficiently done with the small bushes available.

On we went wondering much when and where we should get our next supply of water. Of course we were carrying a certain amount, though, in the circumstances, we were travelling on short rations, and, as it was decidedly hot during the day, we had none too much and not a drop was wasted. It was dusk when we came to the top of a sand-hill and saw Lake Amadeus lying at our feet (Fig. 42). Just where we stood above it, the bed was not more than three-quarters of a mile in width, but east and west it stretched away to the horizon, widening out, especially westwards, into a vast sheet many miles across. There was not a drop of water, only a dead level surface of pure, white salt, standing out sharply and strongly against the rich, ruddy after-glow in the west, the dull, steel-blue sky in the east and the dark purple banks, covered with scrub, which margined it north and south. Previous to our coming only

Fig. 43. CROSSING LAKE AMADEUS.
The tracks in the foreground were made by us on our first crossing.

Gosse, Giles, and our leader had seen or crossed the Lake, the bed of which, judging by Giles's experience when he was baffled in his attempts to cross it, is very boggy and treacherous. However, we dismounted and led our horses across without any difficulty, and, just as it grew dark, camped on the top of a low rise on the southern bank (Fig. 43). The silence was intense—not a bird's note of any kind and no sign of animal life save a gaunt old dingo who followed us half-way over and then turned back on our tracks, probably to end his days in the native well near Winnall's Ridge. The white sheet of salt, seen through the thin sharp stems of the mulga amongst which were we camped, looked strangely weird ; and as we sat round our camp fire smoking and making the most of our carefully measured-out allowance of tea, we thought of the strong contrast between the silence and sterility of the scene, as we looked down upon it now, and the fertility and exuberance of life which must have characterised it in bygone ages when it was a great sheet of fresh water, surrounded, doubtless, by a rich and varied forest growth amongst which browsed huge Diprotodons and birds as large as the New Zealand moa.

There was neither food nor drink for the horses, and all that we could do, as it was no use letting them loose, even closely hobbled, was to tie them up to trees, near to our camp, to prevent them from wandering far away during the night. The few hours that we rested were not especially comfortable to either man or beast, and after breakfasting by starlight, we started off and soon found ourselves amongst a long series of high sand-hills running from north-west to south-east. As our track lay approximately due south we had to cross them slantwise, one after another, and a more miserably

monotonous and toilsome method of travel can hardly be imagined. These sand-hills were considerably the highest that we met with, some of them being fully one hundred feet in height. What made it far worse was that they were covered with tussocks of porcupine grass,[1] each of them like a huge pin-cushion, with the pins represented by long knitting needles, radiating in all directions (Fig. 41). The leaves when young are flat and green and cattle will eat them, but as they grow older they dry and roll up into a stiff needle-like cylinder. The tussocks, unfortunately, grow so close together that there is no avoiding them, and the legs of the poor horses are continually being pricked and irritated. Further still, porcupine-grass country is one in which it is perfectly useless to search for water.

Desolate though the land was we continually met with little kangaroo-rats (*Bettongia lesueurii*) dodging in and out amongst the tussocks, and in one place had an exciting chase after a little, but extremely active, mouse-like creature, which was finally captured as the result of a well-directed shot with a boot, hastily snatched for the purpose from the foot of our energetic leader. It turned out to be a new species of the genus Sminthopsis, which includes the so-called pouched mice. We never had the good fortune to meet with another specimen, and it remains—and, judging by the narrowly restricted area to which many of the Central Australian animals are confined, is likely to remain for long—the sole representative of its special kind known to science. There is nothing to tempt ordinary travellers into this desolate, forsaken part of Australia; in fact no one has been there since our

[1] Species of Triodia. This is often called, popularly, Spinifex. The real Spinifex is, however, a very different grass, and it is unfortunate that the two names should have become confused.

Fig. 44. AYERS ROCK.

visit, now more than ten years ago, and no one is likely to go there again for years to come.

About ten miles to the south of the lake, we came across another native well called Kūrtitina. It was a deep hole in a deposit of travertine, but much shallow than in the case of Unterpata. It starts with a diameter of, at most, three feet and runs down slanting and slightly curving round for ten feet, where there is just room for one person to turn. From the base of the main hole a smaller one runs off sideways, going down about two feet deeper. In this there was a deposit of black mud. We scooped this out and then water began to trickle in very slowly—so slowly that we calculated it would take twelve hours to collect three quarts.

For thirty weary miles we traversed the sand-hills and the narrow intervening flats covered with small, funereal looking "desert oaks" (*Casuarina decaisneana*), where, at least, the ground was hard and the horses, sore and tired with toiling over the heavy sand and amongst the porcupine grass, had a few minutes' respite. At length we reached the top of the last sand-hill and saw Ayers Rock not far away (Fig. 44). From where we stood the level scrub stretched away east, west and south to the distant horizon. Above the yellow sand and dull-green mulga, rose the Rock—a huge dome-shaped monolith, brilliant venetian-red in colour. A mile in length, its sides rising precipitously to a height of two thousand five hundred feet, it stood out in lonely grandeur against the clear sky. Its otherwise smooth sides were furrowed deeply by lines of rounded holes, rising in tiers one above the other, looking as if they had been hollowed out by a series of great cascades down which for centuries past the water in the rain season has poured in torrents from the smooth dome-shaped summit.

We rode on, wondering whether we should find water, and were relieved when we were camped safely by the side of a small water-pool in a deep chasm, hollowed out of the western face of the Rock. It was no small pleasure to watch the horses drink their fill, and to be able to set them free to browse around the base of the Rock, as there was no fear of their straying far away from the water. So far as we ourselves were concerned, it was also a decided relief to feel that we could drink without stint, and could also afford what, after three days' abstinence, was the luxury of a wash. To appreciate this fully you need to have travelled, for two or three days at least, in hot weather, over dry sandy country without any water to spare for such a purpose. There is such a thing, in certain of the drier parts of Australia, as what is known as a "dry wash"—that is, one in which absolutely dry sand takes the place of water—but this, though better than nothing, is not altogether satisfactory. It may, however, be remarked that if, like the Central Australian native, you never wash at all, you never become very dirty, or perhaps, to speak more correctly, you arrive at a certain state and never get beyond this.

After a period of drought it would be very unsafe to rely upon finding water at Ayers Rock. The nearest water which is at all permanent lies eighty miles away to the north, in the George Gill Range, and, so far as we could judge, there would be but little water at Ayers Rock, or, indeed, anywhere else in the surrounding desert country, after a month or two's continuation of the dry weather which we experienced. How the natives manage to subsist as they do, though only in small numbers, is a matter of mystery. There are often long periods of time—month upon month—when no rain falls and when the only supplies of water available to the natives are little

Fig. 45. AYERS ROCK.
Our camp was in the cleft seen on the left side of the photograph.

pools, hidden away from the heat of the sun in crevices in trees and rocks, where their existence would only be suspected by blackfellows, whose instincts have been sharpened by constant struggle with conditions so adverse that it is hard for the ordinary white man, accustomed to a daily and regular supply of food and water, to realise what this struggle really means. When the surface waters disappear, the native digs down, but there are many parts where no underground supply is available, and then he is dependent on the water that he can obtain from the roots of certain trees, which he cuts out of the ground. He divides them into lengths of perhaps three or four feet and, standing them upright, allows them to drain into a wooden bowl. At the worst he will manage, in a most wonderful way, to exist, miserably enough, by actually sucking the dew which collects nightly on the scanty herbage and grass. Yet, though his life is one continual struggle against adverse conditions, he has no desire whatever to leave the land—wretched and sterile though it be—which his ancestors inhabited. Every natural feature is associated in his mind with some ancestor who not only wandered over the country, but actually created the sand-hills, rocks, and trees which now exist, and away from them he would be miserable.

We formed our camp in a deep chasm, cut into the western face of the Rock (Figs. 45, 46). As we lay down to sleep on the ground, we could see just a small patch of sky overhead, shut in by dark precipitous rocks which overhung so as to form a funnel, narrowing from below upwards. We were glad to have a quiet day, as on the march it is impossible to do much serious work, and spent it searching around the base of the Rock. Some idea of the size and nature of this remarkable monolith may be formed from the fact that it rises to a height of eleven hundred feet

above the plains and measures, roughly, five miles in circumference. The Rock, when lighted by the evening sun, is brilliant venetian-red in colour and stands out in strong contrast to the deep blue sky, the yellow sand, and the dull green scrub which stretches away for miles around its base. Its sides are so precipitous that there is only one place at which even the natives will attempt to make an ascent, and so far only one adventurous white man has been to the top. Just at sunset we made an attempt to climb, but were quite content to stop when we had reached a height of about two hundred feet. The surface was so smooth and steep that we could only climb by means of clinging on with our fingers to little projecting flakes of rock. Every now and then there was a slight hump, on the upper surface of which the incline was less steep than elsewhere, and on one of these we came to rest, quite satisfied that the climb to the top was not worth the attendant risks, as the slightest slip would have been fatal. We were, however, amply repaid for the trouble of our short but uncomfortable climb. Beneath us, the sandy plain was dotted over with thin scrub and, away in the distance, it was crossed by dark lines where, mile after mile, the thick mulga scrub stretched across. The level line of the horizon was only broken by the great, dome-shaped masses of Mt. Olga, behind which the sun was setting and, against the rich orange of the western sky, its purple masses stood out in strong relief (Fig. 47). Our camp fire began to show out clearly in the dark chasm beneath us and, to complete the scene, we saw a family of the wild, sand-hill natives making their way, led by our own black boy, round the base of the mountain towards our camp.

Descending, we found that the family consisted of a man with his two wives and three children. None of

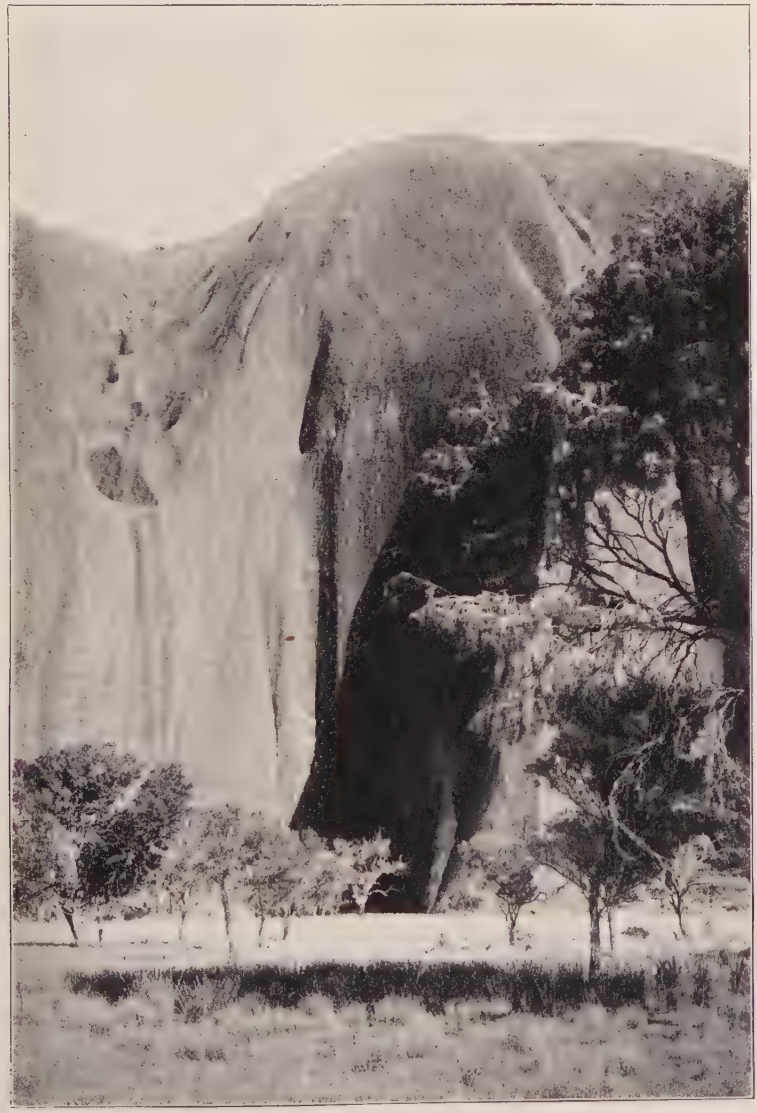


Fig. 46. CHASM IN THE FACE OF AYERS ROCK.

them had ever seen a white man before, and naturally they were at first considerably alarmed, but our black boy, who could make himself understood by them, as he had a knowledge of their dialect, did his best to reassure them, and, after we had given them a little of our scanty supply of food, the man became quite friendly. We found that he belonged to the Luritja tribe, and that his name was Lungkartitukukana. He and his family camped a little distance from us, but after our evening meal we invited him to join our circle round the camp fire, and, with the aid of our black boy as interpreter, attempted to find out something about the organisation and classificatory system of the Luritja. After sundry attempts we realised that the time which we could spend with him was too short to allow of our arriving at any satisfactory conclusion in regard to this matter, concerning which there is something very strange. If you understand the classificatory system of typical Australian tribes you can, after a time, and by means of careful questions, discover, as a general rule, the class system of any tribe with which you may come into contact, unless it be very aberrant. You can find out that every individual to whom you speak—at least this is true of every other Central Australian tribe with which we have been in contact—belongs to one or other of two, four, or eight "classes" as the case may be. Supposing you go, for example, into the Warramunga tribe, knowing previously the Arunta system, and ask a man whether he be a Bulthara or a Kumara. Though neither of these names occurs in the Warramunga tribe, he knows them and at once understands what you mean, and will tell you the equivalent division in his tribe to which he belongs. The Luritja are acquainted with the Arunta terms, but apparently they have no equivalents for them, and all

that is known as yet is that the tribe is divided into two halves, the names of which, if they have any, are unknown. A man will tell you that he cannot marry a particular woman because she belongs to the "wrong side," or that he can marry another particular one because she belongs to the "right side," and that is all that we know at present in regard to the classificatory system of this enigmatical tribe. Its members inhabit the utterly inhospitable country which stretches around the south, west, and north-west of the Arunta country, from Lake Torrens in the south to the far western limit of the Macdonnell Ranges. It may be that the Luritja tribe consists of groups which, for some reason or another, have been driven out into the sterile desert country from the more favoured parts amongst the central ranges and have undergone degeneration. It is hard to realise that any people would of their own accord trek from better country into such a miserable forsaken land as that now held by the Luritja. On the other hand, their occupation may date back to the remote time when, under more favourable conditions of climate, Central Australia was a land of flowing streams and luxuriant forests. As we have already said, the size of the watercourses and the gorges which they have hollowed out at once attract the attention of all travellers. They are out of all proportion to the present flow of water, and seem to afford the clearest possible evidence that continuous desiccation has been the leading feature in the recent history of Central Australia.

Though we only came across this one family at Ayers Rock, yet clear evidence of the presence of natives was afforded in the shape of numerous drawings made on the walls of shallow caves around the base of the rock. A few characteristic ones are shown in the accompanying

drawings, which are reproductions, for the most part, of rock paintings in this part, but at the same time are characteristic of those met with in many places amongst the rocky ranges of Central Australia (Plate II). It may be as well to say here that there are two quite distinct sets of rock drawings made by the Central natives. One, including such as those here figured, are made for amusement during idle hours—"play about," as the natives say—and can be seen by men, women, and children. The other series is quite different in significance, though, as a matter of fact, the actual form of the design may be identical with that of one of the ordinary ones. This second series includes those which are of a sacred nature, and are drawn on spots near to which no woman, child, or uninitiated youth dare venture on pain of death.

The materials commonly used are red and yellow ochre, charcoal, and a white substance such as kaolin or powdered gypsum. The pigment is first of all ground up finely. Sometimes the teeth are used for this purpose, though it is more usual to employ two stones, one a nether stone, flat and thin and often of large size, perhaps even a yard long, and the second, a rounded pounder held in the hand. When ground up the ochre and gypsum are sometimes mixed with fat or grease but more often with water, the finger, or a twig of suitable size, sometimes merely flattened at one end, sometimes with a little hair string wound round it, being used as a primitive kind of paint brush.

There is one particular form of drawing which stands by itself and is met with far and wide over the whole Australian continent. This is the stencilled hand or, as it is commonly called, the "red hand." It is produced in a very simple manner. The hand is placed against a flat rock surface which has been previously damped. Some-

times direct from the mouth, or at others from a little sheet of bark, powdered ochre or charcoal is blown against the hand, with the result that the latter is clearly outlined on the rock and the well-known design is made about which much has been written. As a matter of fact it has no hidden, mysterious, or occult significance of any kind whatever; it is merely what the natives call "play about." There are, however, real drawings of hands and feet met with, though only very rarely, which are of a sacred nature. These are not stencilled but drawn in solid colour, and represent the hands and feet, or the tracks, of mythic ancestors.

The remainder of the ordinary rock drawings may be divided into three series, the first representing, or suggested by, plants, the second associated in the same way with animals, while the third can only be described as geometric. It is strange how rarely examples of the first series are met with. Now and again, as in Fig. 9, the drawing evidently represents a leaf, probably the large frond of a cycad, which grows amongst the Ranges and, being so different from all the other plants with which he comes in contact, must often attract the attention of the native.

Possibly one reason why plant forms figure so little amongst the rock drawings is that these are only made by the men, and that it is the women who, as a general rule, gather vegetable food, with the result that plants do not appeal much to the men.

Amongst the animal drawings there are a certain number the meaning of which is self-evident, but for the most part they are so conventionalised that it is not at all possible to be quite sure what particular animal each one is intended to represent. Fig. 1 is probably meant for a dingo and is drawn merely in outline in charcoal. Fig. 2 is apparently a somewhat conventionalised drawing of a bird

NATIVE ROCK DRAWINGS.

PLATE II.

Face p. 118

with a long tail. Crude though it is, there is a certain amount of suggestiveness in the pose, the long tail, like that of a wren (Malurus), erect in the air, and the head a little on one side, while the drawing of the legs, though they are for some reason joined together, shows that the native artist had a distinct appreciation of the pose of one of these birds hopping along the ground. Fig. 3 is the usual conventionalised drawing of a lizard, though embellished with radiating lines at the head end. Fig. 4 is a still more conventionalised drawing of the same, the artist having given vent to his fancy in regard to the hinder end. Fig. 5 is often met with in many parts of Australia and its meaning is unmistakable. It represents a snake coming out of a hole in the rocks—an actual hole being often used for the purpose. Fig. 6 is some animal form so conventionalised that no attempt can be made to say what it is supposed to represent. Judging by Fig. 4 the blunt end is the head, and comparing it with Fig. 2 the looped yellow lines may be supposed to indicate legs. The spots are distinctly of the nature of "play about" and have been added because they gave the artist pleasure. Fig. 7 is a series of human heads drawn in outline of charcoal. They were placed in a group on the wall of a shallow cave at Ayers Rock and, were it not for this fact, it would be rash to form any conjecture as to the meaning of the two lower ones. Fig. 8, representing an emu seen from below and sitting on its eggs, drawn on the rocks at Reedy Creek, has been already described (p. 100). Fig. 11 is probably a modified form, so far as the main outline is concerned, of an animal such as that drawn in Fig. 3. The head is indicated by a slight forward projection which melts into the limbs on each side, the hind limbs being only represented by blunt projections at the opposite end.

The alternate lines of red and yellow which radiate from the whole surface are evidently intended as an embellishment and have no special meaning.

Fig. 12 is of a different nature, and probably represents one of the stone knives with a resin haft which is only conventionally indicated, especially as regards the attachment of the blade.

The remaining figures belong to those which may be described as geometric in form. A few only of these are here shown. They consist of concentric circles or spirals drawn in red, yellow, white, and black, sometimes only one colour being used, but usually there are at least two. They may be very simple and even irregular in form consisting, as in Fig. 15, of a looped line, or they may be much more elaborate and complicated, as in Fig. 17, which is copied from a design drawn on the rocks at the George Gill Range. The most notable feature in connection with them is that they bear a close resemblance to, and indeed in many cases are identical with, certain of the designs drawn at sacred spots and intimately associated with the totems. That they are suggested by the latter there can be no doubt whatever, but it is very characteristic of the savage's way of thinking to find that, of two designs, identical so far as form is concerned, one, which is drawn on a rock surface, at one spot, has no meaning whatever and is simply "play about," whilst the other, drawn at some sacred spot, is full of significance and symbolises an animal or plant to which, as a general rule, it has not the faintest resemblance.

Close to our camp there were several shallow caves at the base of the Rock. These had evidently been used for shelter by the natives for long years. Their roofs were darkened in parts with the smoke from small camp fires, and their walls were thickly covered with drawings

such as those described above, the meaning of some of which were quite clear whilst others were equally unintelligible.

After spending a day at Ayers Rock, so as to give the horses a rest, we set off to visit Mt. Olga. The country between this and Ayers Rock is covered with the usual wiry shrubs of cassia plants and belts of mulga, amongst which, for the first time, we came across the burrows of a honey ant (*Melophorus inflatus*)—an insect which we were most anxious to see in its native habitat. The Arunta natives call it Yarrumpa and esteem it very highly as an article of food; in this miserable part of the country it is one of their few delicacies. In some places the whole surface of the ground was turned over, just as if a small army of gold prospectors had been at work. There is nothing on the surface to indicate the existence of a burrow, except a little opening about an inch in diameter. From this the central burrow runs straight down. The natives soon found one or two, and immediately set to work to dig them out. It was astonishing to watch the speed with which the elder woman worked. First of all, the ground around the opening was loosened with a digging stick held in the right hand close to the lower end. The earth was scooped out with the aid of a small wooden bowl held in the left hand, and alternately loosening the soil with the stick and then throwing it behind her, the lubra soon sank a hole just big enough to hold her body. The main burrow went down for between five and six feet, with horizontal passages going off all round it. A few of the honey ants were found in each of these, but the greater number were in a swollen chamber at the base. In the nests which we dug up we only found two kinds of ants, one the ordinary worker and the other the honey ant (Fig. 48). The latter is a

most remarkable instance of the modification of certain members of a social community to serve a special purpose, and it is also a noteworthy fact that precisely the same modification is met with in the dry and arid parts of Mexico and Colorado. Instead of storing up honey in combs as a reserve supply of food when this is otherwise scarce, these ants utilise the bodies of certain members of the colony. Exactly how the honey is obtained is not known. It is quite possible that the main source is the exudation of insects, such as the Lerp and species of Coccus; or the sweet material, afterwards manufactured into honey by the ants, may be derived from the so-called "mulga apple," which is really a gall formed on the tree. In America the sweet material is derived from a gall which forms on oak trees. The final result is that the special insect is fed until its crop, in which the honey is stored, becomes so enormously distended that the abdomen has the form of a spherical bag with dark little plates, widely separated from one another, on the upper and under surface, which represent the hard outer covering of the abdomen in the normal ant. The head and thorax form only a tiny kind of appendage to the abdomen; and the insect, being quite incapable of movement, can do nothing but remain quiet, wherever it happens to be placed when this remarkable feeding process occurs. When the ants wish to take advantage of this reserve supply of food, they are said—though the process has not been watched in the case of the Australian insect—to come and tap the sides of the swollen abdomen with their feet. In response to this stimulus the honey is passed out in drops from the mouth of the animated honey-pot and is then eaten by the others. It is a very strange fact that identically the same modification, and that a most remarkable one, unparalleled elsewhere in the

Fig. 47. DISTANT VIEW OF MOUNT OLGA FROM THE SIDE OF AYERS ROCK (p. 114).

Fig. 48. HONEY ANT (*Melophorus inflatus*).

animal kingdom, should have taken place in two parts so widely separated as North America and Australia. The utilisation of the nectar of flowers, or of sweet material secreted by other insects for the manufacture of honey, seems to be a faculty possessed only by members of the Hymenoptera amongst insects. Bees store it in combs, ants in the bodies of certain members of the community; and in regard to this particular point, both of these insects are more sagacious than the Australian savage, who literally takes "no thought for the morrow," and never thinks of laying in a store of food to help him to tide over bad times.

It must have been rather a severe trial to the feelings of our savage companions to watch the honey ants, which they dug out, being transferred to the collecting bottle. They could not understand that they were of any value save as an article of food. Though we did our best to recompense them afterwards, we could not help admiring the way in which these savages, without the least expectation of receiving anything in return for their labour, worked hard, simply to assist us. It seemed to give them just as much enjoyment to please and help us as if they had been working for themselves.

On this occasion we could not find any of the winged individuals, but subsequently Mr. Cowle not only secured these but found a new species of honey ant and a considerable number of examples of another of which we only found a few when travelling, in 1894, amongst the Macdonnell Ranges. Neither of these have the body as swollen as in the case of the commoner form, and both of them are capable of a certain amount of movement. One of them (*Melophorus cowlei*) is golden-red in colour. We only came across a single nest of this species, under a little block of quartzite lying on the ground in a gorge

amongst the Ranges. The nest consisted of irregular branching passages, close to the surface, and in these the ants, the native name for which is Itutuni, were sluggishly moving about. The new species discovered by Mr. Cowle (*Melophorus midas*) is much darker in colour and, though distinctly swollen out, yet the abdomen does not become anything like so tensely distended as in the commoner insect. Evidently these two are not so fully specialised in this respect as is *Melophorus inflatus*, the Yarrumpa, which is *par excellence* the honey ant of the dry and arid parts of Central Australia. Its distribution extends, at least, from Ayers Rock in the south to the Burt Plain on the north of the Macdonnell Ranges and far away across the intervening desert into West Australia, from which part the specimens first described by Lord Avebury were probably secured.

There was very little of interest, apart from these honey ants, to be seen on the twenty-five miles' ride across the desert country between Ayers Rock and Mt. Olga. Mt. Olga may be described as consisting of a basal hummock of irregular shape, arising at a low angle from the plain with a maximum width of perhaps eight miles (Fig. 49). From this, again, rise enormous rounded masses, like a number of Ayers Rocks thrown together, only that each of them is, not only relatively in proportion to its base, but, absolutely, much loftier than Ayers Rock. Magnificent ravines, the sides of which rise precipitously for upwards of fifteen hundred feet, separate the dome-shaped masses, and we steered our course so as to pass round the base of the southernmost of them.

Before reaching the Mount we had to ride through a final belt of mulga, and suddenly emerging from this, came out on to an open patch of ground where, to our mutual astonishment, we found ourselves close to a

Fig. 49. MOUNT OLGA.

number of wild, sand-hill natives who had here built their little "wurleys" or lean-to shelters. They must have been busily engaged with something, because apparently they had no idea that strangers were near until they actually saw us. The men immediately jumped to their feet, seized their spears and poised them on their womeras or spear-throwers, but by good fortune Lungkartitukukana had come with us and his powerful voice was heard, just in time to save us from what would have been a very uncomfortable reception. Though much alarmed, they lowered their spears and we rode close up to them. They had never seen either a white man or a horse before, and when we dismounted and the beast came in two, they were terrified and could do nothing but huddle together on the ground, weeping with fear. However, with the assistance of Lungkartitukukana, we reassured them and tried to persuade them to follow us to our camp, but without success, for, as soon as we had gone into the ravine, at the entrance to which we camped, they made off with all their possessions and fled up one of the lower hills flanking the main mass. There, as darkness came on, we saw their little camp fires dotted about the hill side. They probably spent an anxious night watching us eat our evening meal, and then in some, to them, mysterious fashion, bring forth smoke from our mouths as we sat in the light of our camp fire.

Five years before this, the explorer Tietkins, coming in from the west, had visited the spot, and we found the trees which he had marked by the side of his camp, and even came across remnants of the four wooden boxes which he records in his journal as having left here. Giles had described the existence of permanent water both here and at Ayers Rock. It is most unsafe to

speak of any waterhole in Central Australia as permanent. Everything depends upon the season. At Mt. Olga Giles found a running stream flowing away across the flat country to the south. We found only indications that in good seasons the creek might flow for a short distance, and at first were afraid that there was no water to be had for our horses. Following up the ravine we came, however, to a small pool about a yard in diameter, and were thankful to be able to give them all a drink. Our native guide assured us that this was absolutely the only water available, but doubtless there were other pools amongst the deep ravines—probably, however, inaccessible to horses—about which he discreetly said nothing.

The huge masses of Mt. Olga are formed of a coarse conglomerate of younger age than the arkose sandstone of which Ayers Rock is formed. They are deep red in colour except for great streaks of black, which look exactly as if tar had been emptied on to their summits out of some giant cauldron, and had then run down their smooth sides, hardening as it did so. Here and there the black and red were relieved by patches of green, due apparently to lichens growing on the surface.

We had, unfortunately, arranged to be at a special spot in the northern Macdonnell Ranges at a given date, and as there was much rough and trackless country between us and our rendezvous, we had, very reluctantly, to retrace our steps without exploring the ravines of Mt. Olga.

The natives had carefully avoided us, but after striking camp in the morning, preparatory to starting back to Ayers Rock, we made another attempt to come into contact with them. Fortunately, again, the faithful

Lungkartitukukana was with us, and halting at the base of the hill he did his very best to bring the natives down. The contortions of his body as he gesticulated wildly, and at the same time forced out a volume of high-pitched sound, were most remarkable. We could not, of course, understand a word of what he was saying, but his intentions were clear and his efforts were finally successful. Slowly, and evidently not without fear, the blacks came down to us. We treated them to some sugar and fat, but the former, as they had not seen it before, they at first looked upon with suspicion. A savage is always thinking about magic, and to anything which he does not understand he attributes evil magic. However, when we tasted the sugar and no harm came to us, they were reassured and were soon prepared to receive any amount. We made one rather unfortunate mistake. One member of our party was anxious to give them a taste of tea, another in his desire to enter into friendly relations thought of coffee, of which we had a small supply, with the result that the two beverages were mixed in the one can. The infusion was considerably sweetened, but still the natives did not like it, though it was only when comparing notes afterwards that we understood the wry faces made by the men who, partly out of fear and partly out of their desire to please us, were too polite to refuse to drink. They must have gone about for days afterwards in fear and trembling as to the result of the white man's potent drink. To their great delight we gave a few wax matches to one or two of the older men as a mark of distinction, for in Australian tribes it is always well to pay marked attention to the older men, however decrepit they may be. The magic of the matches filled them with respect for us. We had only to rub the brown head of the little white rod on a stone, or even

on our own bodies, and out from it burst the fire. The matches which we gave them were promptly stowed away amongst their greasy locks and were probably of little use, as they were sure to get damp at night time when the dew fell. That they could not obtain fire from them would be easily explained by the fact that the magic of the white man was stronger than their own, and therefore the white man could obtain fire from them when they were unable to do so.

It was astonishing, when once they realised that we were friendly to them, how quickly the natives placed the most implicit trust in us ; and three of the men who, only half an hour before, were in deadly fear of us, now insisted on accompanying us to Ayers Rock. Without any difficulty at all, though we were riding, they kept pace with us, sometimes running, sometimes walking, and all the time they were talking, evidently trying to point out to us the features of the landscape which were of interest to themselves and which they naturally thought would be of interest to us—as, without doubt, would have been the case, if we could have understood what they were saying.

It was late in the afternoon when we reached our camp. To the west we could see the purple masses of Mt. Olga standing out against the orange-coloured sky. The rays of the setting sun were still shining on the precipitous sides of Ayers Rock, which once more glowed brightly, venetian-red in colour, against the cold, steel-blue of the eastern sky. Gradually the light faded away and there was left only the dim mass of the Rock with the deep chasm in its side, in which we and the natives were camped.

The natives had been lucky enough to catch two kangaroos on the way over, in addition to sundry

smaller animals such as lizards. In several places we had set fire to the porcupine grass and the thin scrub, with the result that numbers of smaller animals were driven out of their shelter, to fall a prey both to the natives, who are wonderfully expert in catching them, and to the hawks, who made their appearance, in a most mysterious way, the moment the smoke of a fire was seen. The kangaroo was the common red species (*Macropus rufus*), which is the only kind, so far as we could find out, that inhabits the sterile, plain country in this part of Australia.

As soon as it was dark the natives set to work to prepare their feast, laughing gaily and chattering hard the whole time. They had a good fire, plenty of food and water, and needed nothing more to make them perfectly happy; our presence did not seem to interfere with them in the very least. Sitting round their fire, two of the men began to prepare one of the kangaroos for cooking. The first thing they did was to take the strong tendon out of each hind limb. To do this, the skin was cut through close to the foot, with the stone flake attached to the handle end of a spear-thrower. Without, at first, cutting the tendon itself, a hitch was taken round it, at its lower end, with a digging stick. Then with one foot against the animal's rump, each man pulled steadily until the upper end of the tendon gave way and he could draw it out. Then, with the loose end held in the mouth, the tendon being stretched to its full extent, the lower attachment was cut with the stone flake. After being thus carefully extracted it was rolled up and stowed away in the man's waist girdle. A tendon such as this, obtained from kangaroos and emus, is of the greatest value to the savage. He uses it for such purposes as that of fixing the point on to the end of his spears and spear-throwers,

binding round the splicings on the shaft of his spear or mending broken implements, in the same way as we should use string or wire. The tendon is damped so as to make it pliant, and, as it dries, of course it contracts and exerts a strong pull. Every native is provided with a sharp flint and tendon, just as every white boy has a knife and string.

As soon as the tendons had been successfully extracted, a small opening was made with the flake in the animal's body, and through this all the intestines were pulled out and cut off. The sides of the cut were fastened together with a wooden skewer, the tail cut off at the stump and the limbs dislocated. As a general rule, amongst the Arunta people at all events, as soon as ever an animal, such as a kangaroo or wallaby, is killed, its hind limbs are immediately dislocated. This is done, partly to add a feeling of security—that it cannot, even if it returns to life, run away and escape, as many of their ancestral animals are reported to have done—and partly to render its body limp and thus more easy to carry. An animal in this condition is said to be "atnuta," the nearest translation of which is our word "limp," though it also implies a condition of helplessness.

The intestines were handed to the women and children, who cooked them by means of rubbing them over and over in the hot sand and ashes of the camp fire. Two of the men had meanwhile scooped out a shallow hole with their digging sticks, just large enough to hold the body of the kangaroo, and had lighted a good-sized fire in it. After this had burned down and nothing was left save red hot ashes, the kangaroo was laid on the latter, some of which were piled over it, but not so as to cover it completely. The fur, which had been left on, was singed off or, at least, the greater part of it was, the skin

serving to keep the juices within the body. After lying for an hour in the hot ashes, it was supposed to be cooked and was lifted out and placed on small leafy branches, torn from a neighbouring acacia tree. The carving was done by one man, who first of all extended the original cut so that he could take out the liver and heart, which were first eaten. Then, with the aid of a sharp digging stick, he cut the body up, very roughly indeed, into joints, using his teeth to aid him in tearing off the burnt skin and helping himself to such dainty morsels as the kidneys as he went along. There did not appear to be any special portion given to any particular individual, everyone, men, women and children, receiving a share, though of course the men were supplied before the women. The animal was, at best, only half cooked—some parts were almost raw—and those who wished their portion better cooked, simply rubbed it up and down in the hot ashes until it was done to his, or her, taste.

The sight was not at all an appetising one, and the savages looked more like wild beasts gnawing their prey than human beings; but it was intensely interesting to us, as it was the first time on which we had really come into personal contact with the absolutely wild Australian savage. We saw him, first of all, capture his prey with his sharp-pointed wooden spear. Then, quite ignorant of metal knife, he had extracted the tendons and cut its body open with a sharp stone flake and had cooked it on a fire made by rubbing two pieces of wood, a hard and a soft one, on each other. It was a truly wild scene. Our camp fires lighted up the rocks that hemmed in the chasm in which we were camped and shone upon the bodies of the natives. As we rolled our rugs round us on the hard ground and watched the stars shining down

through the cleft in the great rock, we realised that we had been carried far back into the early history of mankind and that we had enjoyed an experience such as now falls to the lot of few white men. We had actually seen, living in their primitive state, entirely uncontaminated by contact with civilisation, men who had not yet passed beyond the palæolithic stage of culture. In some parts of Australia, where food is more abundant and their sole anxiety is not that of eating it as soon as they get it, cooking arrangements are much more elaborate. A deep hole is dug, at the bottom of which hot stones are placed and these are then covered with green leaves on which the food is laid. Then comes another layer of leaves so as completely to protect the food from contact with the earth with which the hole is finally filled. Those who have tasted meat cooked in this way will realise that the savage method is not to be despised. It has the great advantage of retaining all the natural juices within the meat, more especially if the operation be conducted in circumstances which allow of a really efficient coating over the joint, such as can be provided by a layer of flower paste. A leg of mutton thus cooked is decidedly superior to the ordinary article, but perhaps the fact that one only cooks in this way out in the bush, when almost anything is palatable, makes it rather difficult to draw comparisons.

It was late at night before the natives had concluded their feast ; in fact we had retired to our camp, a little way from theirs, some time before they coiled themselves around their fires and all was quiet in the dark chasm. We were up early next morning, and, soon after sunrise, started on our return journey to the George Gill Range. Our horses had had plenty to eat and drink, and we pressed on rapidly, crossing Lake Amadeus once more, until we came to the native well called Unterpata, where

we hoped to find water. To our disgust we found that another dingo had fallen in since we were there before. Its body had been dragged out by some natives who had visited the well during our absence. As the horses were again thirsty, we tried to persuade them to drink some of the water, which we baled out into a sheet of canvas, but it was so foul that only one or two of them would even taste it ; the smell was quite enough for both them and us, and we carried the evil odour of that sheet of canvas with us for many days as a reminder of the native well. There was nothing for it but to take it in turns to watch the horses all night long, lest, closely hobbled though they were, they should wander away in the hope of finding water somewhere. The night hours passed by very slowly as we paced up and down, for it was cold—so cold that at daybreak our water bags were frozen solid.

After three days' ride we were back again at the George Gill Range, thankful to be camped beside a good water-pool. During the two weeks which had elapsed since we were last there, the water, to our surprise, had considerably increased in quantity, though not a drop of rain had fallen. Except during the very few days when rain is falling, running water is so extremely rarely met with in Central Australia that its occurrence excites great surprise and interest. When, with the camel team, we were camped at this spot a fortnight earlier, there was a series of disconnected, small water-pools in the bed of the creek which came down the valley. A thin stream of water now trickled in and out of them, and the lowest pool, surrounded by bulrushes, was at least three times as large as it was when we were previously camped by its side. The only possible explanation of this is that there is a constant though small supply oozing out of the hills. For the greater part of the year the evaporation is so

great that the supply is hardly enough to keep the pools filled; in the cooler, winter months, when we were there, there is no evaporation for perhaps half of the twenty-four hours, or, at most, only a slight one taking place, and, in consequence of this, the supply is just sufficient to maintain a continuous flow. If the desiccation of the Central area continues, the time will come when even the present small flow of water will become less. For a time perhaps there will be a few pools which, for a little while after the rain season, will be filled with water, but the present slight flow, even during the cooler months, will cease, just as it has done already at Ayers Rock and Mt. Olga.

We had now left the true desert country behind us, and spent the next three days traversing in succession the George Gill, the James, and the southern flanks of the Macdonnell Ranges, with their intervening flats and valleys, until, as previously arranged, we met the main camel team at a deserted cattle station near the base of Mt. Zeil. It was two weeks since we had parted company at Reedy Creek, and, curiously enough, we arrived at our rendezvous within half an hour of one another, which was fairly accurate timing on the part of our respective guides, as we had been crossing difficult country, comprising desert, sand hills, and rocky ranges where there were no tracks and everything was as wild as possible, and where at times travelling was anything but easy.

CHAPTER VII

THE HIGHER STEPPES

To a certain extent the Lower and the Higher Steppes merge into one another ; but, roughly speaking, we may regard the dividing line as coterminous with the northern edge of the great Cretaceous plain which rolls up against the southern flank of the central ranges. Approaching from the south it is quite a welcome change, after traversing the dreary country of the Lower Steppes, with its flat-topped hills, to see ahead a range of rugged, dark-red rocks, the southernmost ridges of the more ancient formations which constitute the backbone, as it were, of Central Australia, running for between three and four hundred miles east and west across the country. A reference to the maps and sections will give some idea of the main physiographic features of this remarkable part of Australia.

Broadly speaking there are two great ranges running parallel to one another, separated by a trough which varies in width from at least twenty miles at its western end to rather less than half a mile at its eastern limit in the neighbourhood of Alice Springs (Fig. 50). The southern, which is known as the James Range, does not extend so far east as the northern one, dying down into an intermittent series of small hills to the east of the Todd River. Various names have been given to its component parts, which to a

certain, but only vague, extent are separated from one another. From west to east the names of these ranges are as follows :—George Gill, Levi, Krichauff, Waterhouse and Ooraminna. All of them are, in reality, but parts of one long series of folds, though they are not so regular in their formation as in the case of those constituting the great Macdonnell Range, which lies to the north of them.

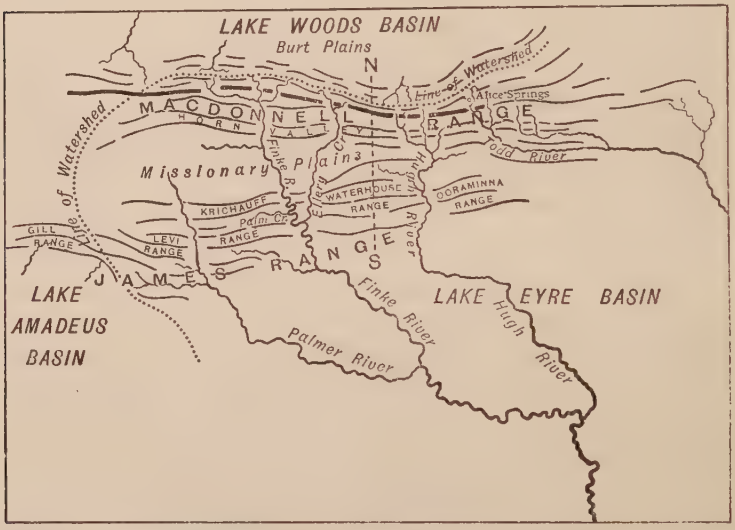


FIG. 50.—Diagram illustrating the general arrangement of the Macdonnell and James Ranges and the rivers that cross them. The thickest line indicates the ridge from which the highest peaks of the Macdonnell range now rise. The sources of the main streams lie to the north of this ridge. The dotted line from north to south indicates the line of section in Fig. 47.

A section from south to north anywhere across this part of the centre of Australia shows the features represented in Figure 51. In the south we have the James Range rising from underneath the Cretaceous plain. This consists (in the region of George Gill and Levi Ranges) of a main ridge, formed entirely of Ordovician rocks, flanked on the north by smaller ridges enclosing valleys running

east and west. These are followed by a wide open plain, extending to the southern base of the Macdonnells, which may be divided into four component parts, arranged with remarkable regularity. In the south there are two narrow ridges which rise for a height of, at most, fifteen hundred feet above the narrow valley which they enclose. This valley, now known as the Horn Valley, runs along from the very western end of the Macdonnells until its identity becomes lost amongst the more irregularly arranged masses at the eastern end, where the Macdonnells sweep round to the north to merge into the Hart Ranges. For the greater part of their length the two ridges enclosing the Horn Valley are only a few hundred feet in height—

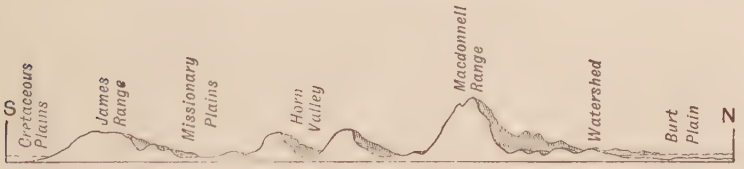


FIG. 51.—Diagrammatic section from north to south across the Macdonnell and James Ranges. The section is taken along the line N-S in Fig. 46.

that is, above the level of the valley. Each of them has a perpendicular escarpment on its northern face, varying in height from perhaps fifty to three hundred feet, as in the case of Mt. Gillen near Alice Springs. The capping which forms this escarpment is composed of Ordovician quartzite, beneath which the older, pre-Cambrian, gneissic rocks slope down at an angle of 30° to 40° into the valley. The southern face of each ridge, though fairly steep, has a gentler slope than the northern one. At no place has the Horn Valley a greater width than, at most, half a mile, and its persistence over such an extent of country is one of the most striking features in the physiography of the Central area. The northernmost of the two ridges bounding

it is succeeded by a wider and more irregular but still well-defined valley. In parts it reaches the width of a mile or perhaps even more. To the north of this lies the main mass of the Macdonnells, formed of very old metamorphic rocks (pre-Cambrian), capped here and there with Ordovician quartzite, the equivalent in age of the rocks forming the whole mass of the James Range. At the western end there are a series of bluffs and peaks irregularly massed together—Mts. Edward, William and Francis, all about 4600 feet in height, and Mt. Heuglin, 4700 feet. To the east, and extending from 132·5° to 133·5° E. Long. there is formed a more or less definite ridge, running parallel to the one which bounds the Horn Valley on the north. From this arise a succession of peaks, Mt. Zeil 4,040 feet, Mt. Sonder 4,496 feet, Mt. Giles 3000 feet, Paisley and Brinkly Bluffs, and Mt. Conway. Just before reaching Alice Springs this ridge decreases in height and tends to become merged into the series of irregular ranges which form the main part of the Eastern Macdonnells. The main ridge with its peaks is flanked all along its length, on the north, by a jumble of low hills as much as twenty miles in width, which finally dip beneath the Burt Plain that stretches away northwards to the very centre of the continent.

A glance at the map will show at once a further most striking feature in the physical geography of this region. Not only do the mountain ranges run with remarkable regularity from west to east, but with equal regularity the river courses run right across them from north to south, actually taking their rise in the middle of the jumble of low hills which lies to the north of the main range, or, rather, the ridge from which now rise the highest peaks. The only possible explanation of this is that the main trend of the river courses was determined at a very early period

before denudation had seriously affected the surface of the Ordovician deposits. After the deposition of the formation spoken of above as pre-Cambrian, earth movements must have resulted in the elevation of the latter to form a broad, central ridge, dome-shaped in section, running east and west. The great amount of metamorphism which the rocks have undergone is doubtless associated with these earth movements and with the intrusion of eruptive dykes. At this time such streams as there were would run north and south on either side of the line of watershed represented by the central ridge. The capping of Ordovician quartzite, which now forms the summits of some of the loftiest peaks in the Macdonnell Ranges, rising high above the pre-Cambrian rocks which constitute their bases, shows clearly that the old pre-Cambrian ridge must have sunk beneath the waters of the Ordovician sea. According to Messrs. Tate and Watt, there are no true Cambrian rocks in Central Australia;[1] if any were deposited they must have been completely denuded. We may imagine the pre-Cambrian hump as dipping gently southwards beneath the waters of the Ordovician sea, which then occupied the area now forming the Lower Steppes. As the Ordovician rocks, laid down in this sea, now reach a height of nearly five thousand feet in the Macdonnell Ranges, it is evident that a subsequent upheaval took place, forming once more a huge east-and-westerly extended hummock, stretching across the centre of the continent. The highest part must have lain along a line corresponding roughly in position with 23·5° south Latitude. This great hummock consisted of a central mass of pre-Cambrian rocks, covered by those laid down in the Ordovician sea, which thinned out from

[1] These authors report the discovery of Ordovician fossils in rocks formerly described as Cambrian. *Horn Expedition Report*, Geology, p. 47.

south to north along the southern face of the old pre-Cambrian ridge on the northern side of which no Ordovician rocks were laid down (Fig. 52). From that time to the present this central ridge—the back-bone of Australia—has remained above sea level and has been undergoing constant denudation. The very fact that we still have left peaks upwards of five thousand feet in height is sufficient evidence that, when the period of elevation was at its climax, the tip of the dome must have reached a height far in excess of that of the present Macdonnell Range, the highest points of which now actually lie to the south of

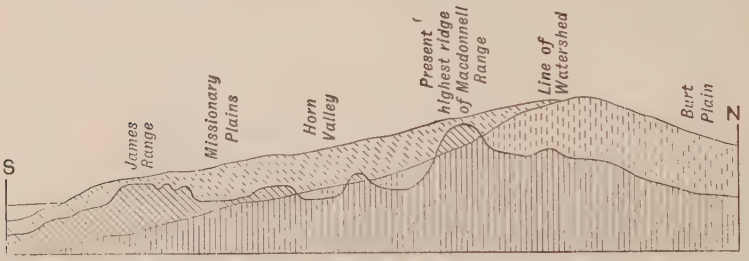


FIG. 52.—Diagram representing the denudation of the pre-Cambrian and Ordovician deposits with the resultant formation of the present ranges and valleys. The slanting lines represent Ordovician and the upright pre-Cambrian rocks. The denuded portions are indicated by dotted lines.

what must originally have been the summit of the old ridge.

This old Ordovician land must, at first, have covered a very considerable area of country, sloping away to the south. For long ages it was exposed to the effects of denudation. In its southern parts only a few peaks remained, lofty enough to stand out above the waters of the Cretaceous sea beneath which it gradually subsided. These isolated peaks now form outliers, distant, in the case of Winnall's Ridge, about forty miles from the George Gill Range, and in that of Mt. Watt, at least one hundred

Fig. 53. FINKE GORGE.

miles from the Krichauff Range, and rise like solitary islands from the dead level of the Cretaceous plains.[1]

The main trend of the rivers draining the surface of the Ordovician land must have been settled at a very early date, when there was simply an elevated hump, or saddle, running east and west across the centre of the continent, the older pre-Cambrian rocks being hidden from view by a thick capping of later Ordovician strata.

The valleys which now run east and west, following the line of strike of the rocks, could not then have existed. At that time there must have been, judging by the present course of the streams, a decided slope to the south, with a more gradual fall northwards. At all events the main flow of water trended southwards and, as the land rose, the streams cut their way across it. There are now six important ones which traverse the ranges in gorges varying in width from only a few feet to perhaps a hundred yards (Fig. 53). These rivers, passing from west to east, are as follows—the main source of the Finke and its tributaries the Ellery and the Hugh; the Todd, the Ross and the Hale. In addition to those which carry these streams, there are other gorges running across the ranges through which no water now flows. In many cases, as for example in those through which run the Finke, Ellery, and Hugh, the ridges which bound the Horn Valley north and south are broken through at points opposite to one another on the two sides of the valley. It has been suggested that these gorges have been formed by the union of ravines which, by chance, lay exactly opposite to one another on the two sides of the ranges and gradually worked back until they met and united. Apart from the extreme improbability

[1] The existence of this interesting outlier was discovered by Mr. J. A. Watt during the Horn Expedition, 1894.

of so many ravines being arranged so symmetrically as this theory would require them to be, there are other facts which are fatal to it.

Not only have we this succession of gorges all running north and south across the main Macdonnell Ranges, but there are even more striking ones which now cut across the James Range farther to the south, carrying, at the rare intervals when they actually run, the water of the Palmer, Finke, and Hugh.

The great Finke Gorge, for example, pursues a tortuous course for no fewer than forty miles, between precipitous cliffs, from north to south, across the Krichauff Range, until it debouches finally upon the Cretaceous plains.

Along the whole line of watershed, in the north, representing the summit of the original hump or saddle, the whole of the Ordovician strata has been stripped from all the underlying pre-Cambrian rocks that now form a jumble of low hills amongst which the Finke and its tributaries take their rise. Immediately to the south of these hills, certain hard masses of Ordovician rock have withstood the effects of denudation, and now form the summits of a line of high peaks and bluffs, which rise from a ridge that is cut across by numerous gorges through which run the streams from the north. These streams had cut deep gorges for themselves across the surface of the Ordovician land, following its slope to the southwards, and had established their line of flow, long before there was any hint of the great east-and-westerly running valleys which now form so striking a feature in the physiography of this Central region and across which they must flow in their course to the south.

How exactly these valleys were formed it is very hard to conjecture, but one thing is certain, and that is that the

Fig. 54. SIMPSON'S GAP, MACDONNELL RANGE.

main trend of the river beds must have been determined long before the longitudinal valleys came into existence; and at the present day they contain only very insignificant streams or, often, none at all.

In some cases, as in that of Red Bank Gorge, and Simpson's Gap (Fig. 54), the sides of the gorges are very precipitous; but in the case of others, such as that through which the Wycliffe flows southwards (Fig. 56), the valley may be much more open. The illustrations will serve to give a good idea of these gaps and gorges, which form such striking and picturesque features of the central ranges.

We had formed great expectations in regard to what we were to find amongst the central ranges, and approached them from the south eager to leave behind us the monotonous, dreary Cretaceous plains of the Lower Steppes. On the Horn Expedition we followed up the Finke until we were close to the point at which it emerged from the Krichauff Range. Then we skirted the southern base of the latter until we struck the valley of the Walker, a tributary of the Palmer. Following this up into the Levi Range, we passed through a narrow gorge into a valley not more than a mile in width. For some reason this received, from its discoverer, Ernest Giles, the fanciful name of Tempe Downs. Though since deserted, it was, at the time of our visit, used as an outlying cattle-run, the "station" consisting of one or two little huts. Drought and the depredations of the natives have since then caused it to be abandoned, and the land has been given over to its original owners; in fact, apart from the presence of some cattle, and one or two white men living a lonely life in this far-away spot, it was, at the time of our visit, as wild as it could well be. The valley itself is nearly 1800 feet above sea level, and

the ranges enclosing it rise abruptly for another five hundred feet. Anxious to get a general view of the country, we climbed the hill on the south. At our feet the valley stretched away westwards for twenty miles, broadening out until it opened into the great plain lying between the James and the Macdonnell Ranges. To the north of us range after range of hills ran east and west, separated from one another by a series of parallel valleys. The range on which we stood was furrowed by deep gorges, in many of which were little rock pools, sheltered in their deep recesses from the heat of the sun which, even in the winter months, is great during the day-time. After a heavy rainfall these little pools contain small fish, and as it is absolutely impossible for the fish to climb into them, owing to the fact that they are placed high up among the rocks, the only way in which they can get there is by means of being carried, perhaps in the form of eggs, on the feet of birds, which are abundant immediately after rain.

At Tempe Downs we spent a few days, enjoying the hospitality of its owner, Mr. Thornton, who did all in his power to assist us, and roaming about along the valleys and over the hills. The bed of the Walker was quite dry, except in the gorge where there were one or two small pools of water, and in these we secured a new species of fish (*Nematocentris tatei*), which we afterwards found in several of the pools scattered amongst the sheltered gorges of the ranges. In the great majority of cases the fish, which are carried down the rivers at flood times, find themselves stranded in pools which only last a short time, and then it is often only a question of a very few weeks, or even days, before they perish. The same pool contained a little fresh-water snail (*Melania balonnensis*), of which we had previously found the dead shells

in the flood wrack piled along the banks of the Finke further south where there was no water. We had in fact, as we very soon realised, come into the part of the central area which served as the reserve ground where fresh-water animals could live during bad times, and whence other parts of the country could be stocked during good seasons and times of rainfall. We were rather astonished to find, both here and elsewhere, that the sandy margin of the pool was marked with ridges made by the mole cricket (*Gryllotalpa coarctata*) as it burrowed its way along through the damp sand. It was a somewhat strange spot in which to find this insect, which, with us in Victoria, burrows in dry earth ; but, amongst the central ranges, the damp sand immediately around the margin of water pools is its favourite location. We never heard it "chirping."

The valley was clothed with a poor scrub of gums, cassias, and acacias. Amongst the scrub on the southern slopes were more open patches dotted over with tussocks of porcupine grass.[1] Searching amongst these, we saw that some of them had their leaves, which are sharp and stiff like knitting needles, encased in red sand. In fact, sometimes the whole plant, except the tip of the leaves, was almost hidden by the sand. Leading away from these sand-encased tussocks, there were numbers of little tunnels, also made of sand. Each of them had a diameter of from a quarter to half an inch. Sometimes they led from one tussock to another, sometimes they left the ground and led straight up the trunk of a gum tree. On hard soil, where the tussocks were not too close

[1] Sometimes, but quite wrongly, called "spinifex." This is an unfortunate error, as the latter name belongs to an entirely different form of grass, which, like the true "porcupine," is widely scattered over the central area. Porcupine is an eminently suitable name for the grass in question.

together, they formed a regular network on the ground. These little tunnels, or galleries as they have been called, have attracted the attention of several explorers in Central Australia, but their connection with the encased tussocks has not been noted, nor have they been carefully examined. They are made by a little ant which builds its nest around the base and roots of a tussock of porcupine grass, and may be popularly known as the porcupine-grass ant.[1] Searching further amongst the tussocks, we found a series of stages showing the first commencement of the casing in sand, and the final stage when the tussock looks like a mass of sand tubes. The tunnels are evidently built so as to allow of the ants moving about without being

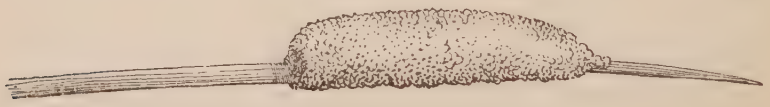


FIG. 55.—PORCUPINE-GRASS ANT CASE.

exposed to the great heat of the sun. They must climb the trees to secure something that the insect wants, but what this is we could not find out. On the tussock a start is made in the form of a little cylindrical chamber about three-quarters of an inch in length (Fig. 55). It is built so that the grass forms one part of the wall, a space being enclosed between it and the sand tube. The upper end is closed over so as to prevent water from trickling in, and a small opening is left at the lower end. Watching the ants, which are small and black-bodied with yellow feet, we saw them constantly running in and out of the chambers, and, on opening some of these, found that they were built over two or more Coccidæ which were attached

[1] It has been described by Mr. W. F. Kirby as a new species under the name of *Hypoclinea flavipes*.

to the leaf of the grass. Here, as in the case of the ants described by Belt in Nicaragua, the Coccidæ extract nutriment from the plant, and the ants avail themselves of the exudation from the body of the Coccus. The arrangement is doubtless of advantage to both insects. The Coccidæ gain protection from enemies to whom, by this contrivance, they are rendered invisible ; they are also shielded from the great heat of the sun, and, at the same time, the ants get a supply of food without much trouble to themselves.

After examining a large number of tussocks of grass, both at Tempe Downs and elsewhere, we came to the conclusion that the network of sand tubes, which sometimes encloses almost the whole tussock, begins in a number of chambers, built over the Coccidæ which, very likely, are brought to the leaf by the ants—though we had no means of testing this. Covered passages are then made on the leaves leading from one chamber to another and so, gradually, the whole tussock is enclosed.

Tracing the passages down to the roots we found the ant nest built around the latter. The nest consists of a roughly conical mass of material composed of sand grains firmly fixed together by resin obtained from the leaf sheaths of the porcupine grass. The largest nest which we dug up measured about eighteen inches in depth and a foot in diameter at the top. It was riddled through with irregularly arranged passages, some an inch in diameter, along which the eggs were lying about quite irregularly. Each nest contained larger and smaller winged forms, small black and larger brown-black, wingless ones, but we could not find a trace of any other form of insect such as a beetle. It is difficult to understand how the ants actually make use of the resin, though there is no doubt that they do so. When the

leaf sheath is handled, the resin sticks to the fingers just like a varnish, and the ants must have devised some way of dealing with it so that, instead of sticking fast when they touch it, they can loosen it from the sheath and carry it away. Perhaps they smear some fluid over it.[1]

From Tempe Downs we retraced our steps along the Walker until we came to its junction with the Palmer. A glance at the map will show that the James Range trends from south-west to north-east, and that it is cut across by three streams—the Palmer on the west, the Finke, with its tributary the Ellery, in the middle, and the Hugh on the east. There are of course smaller streams, such as the Walker and Petermann, which join the Palmer, and the Palm and Ilpilla Creeks, which run into the Finke. These lesser streams follow the valleys trending east and west amongst the ranges—in fact these valleys have been hollowed out by them—but the main streams run north and south.

At the junction of the Walker and Palmer we turned northwards and followed the winding course of the latter as it came down across the ranges. There was a succession of roughly parallel open valleys running east and west and deep gorges running north and south, where high precipices rose on either side of us, hemming in the narrow bed of the river. At times it was no easy matter to find safe footing for our horses amongst the jagged masses of rock of all shapes and sizes which blocked the bed of the stream, or rather would have done so had there been any stream flowing. It was the dry season when we passed through, and only a few small pools of

[1] Mr. J. H. Maiden, in an appendix to the Botany Report in the Horn volume, has shown that the nest is built of sand particles fixed together with resin, a coating of ferric oxide giving the whole the colour and appearance of red-brown clinker.

Fig. 56. WIGLEY GAP, MACDONNELL RANGE (p. 143).

Fig. 57. GRASS TREES (*Xanthorrhœa thorntoni*).

water were to be met with. During the rain season the passage of these gorges would be quite impossible. At night time the cold was severe, though we were actually within a degree and a half of the tropics. Our thermometer, when we were camped one night by the side of a little water-pool close to the entrance of one of the gorges, went down to 16° F. We awoke at 5 a.m. to find our water-bags frozen solid, and at this low temperature the thermometer remained till sunrise. Camped out in the open, with the temperature sixteen degrees below freezing point, we were glad of a good fire between sunset and sunrise. An hour or two after sunrise everything was changed, and we were glad to be on the sheltered side of the gorge. As we travelled northwards, the ranges diminished in height and the river valley broadened, until, at the end of our second day's travel, we reached a spot close to the source of the Palmer. To one side of us the hills ran away to the north-east, and on the other to the south-west. After camping for the night at the base of a little conical hill covered with pines (*Callitris sp.*) we crossed a slight rise and passed out on to a plain, here about twenty miles in width, which separates the James Range from the Macdonnells. Westwards the plain opens out into the desert country, stretching across to West Australia; eastwards it gradually narrows until, immediately to the south of Alice Springs, it is less than a mile in width. The vegetation on some parts of this plain was rather different from that of the country which we had crossed hitherto, and more interesting. In addition to the Eremophilas with their bright yellow, red, and blue flowers, the Mallee gum trees were often thickly covered with a bright red flowering mistletoe. In parts too the scrub was quite refreshingly green with Prostanthera and Currajong, but the most interesting plant was a new species of grass tree

(Figs. 57, 58).[1] The stem of the plant is sometimes fully five or six feet high. It is crowned with a tuft of long wiry leaves, and the flower stalk grows up for another five feet. It is extremely local in its occurrence. There are a few specimens along the Palmer River and a considerable number on a narrow belt of country which stretches east and west along the Missionary Plain for about seventy miles, but, beyond this, we did not meet with them anywhere. In many cases we noticed that the plants were very sporadically distributed. For example we only found specimens of *Swainsonia canescens* (a little leguminous plant) in two small colonies, sixty miles apart, and of *Goodenia horniana* in two places one hundred miles from one another. It is of course quite possible, indeed probable, that these particular plants exist in other parts of the country, but, as a constant watch was kept every day over the very large area of country traversed, and, in the case of the Horn Expedition, traversed in various directions by different members of the party, it is safe to conclude that they are very sporadic in their occurrence, and that they are relics of a once more widely spread flora which have, under the gradually increasing desiccation of the country, been able to persist in certain favourable parts.

It took us a day to traverse the Missionary Plain from south to north. Ahead of us we could see what looked like a series of round, smooth, grass-covered hills, calling to mind the Downs in the south of England, but, when we once got amongst them, we found that they were a series of jumbled hills covered all over with porcupine grass, the tussocks of which were so close together that, seen

[1] Named *Xanthorrhœa Thorntoni* in honour of the owner of Tempe Downs, who first found and showed it to Professor Tate when we were on the Horn Expedition.

Fig 58. GRASS TREES ON MISSIONARY PLAINS.

Fig. 59. CYCAD (*Encephalartos Macdonnelli*) GROWING ON ROCKS.

Fig. 60. WHITE-STEMMED GUM TREE.
Eucalyptus terminalis.

from a distance, they gave the appearance of a smooth carpet of grass. Beyond these low hills we could see the higher peaks of the main Macdonnell Range, but it was dusk before we made our way into the near hills and camped for the night by the side of a small pool of water. Next morning we found a narrow cleft leading into the Horn Valley and another cutting through the ridge bounding it on the north, and were soon camped not far from the base of Mt. Sonder, right in the heart of the Macdonnell Range.

To our intense disappointment everything was as dry as possible, and there was not a trace of the luxuriant vegetation which we had hoped to find. There were, it is true, scattered water-pools ; but a yard away from the margin of these, there was no more sign of moisture than on the parched lands of the southern Steppes. The valleys were covered with the same poor scrub of acacia, cassia, Grevillea, Hakea, and Eremophila as elsewhere.

The hill-sides were dotted over with small pines (*Callitris sp.*), and here and there the strikingly white trunk of a special kind of gum tree (*E. terminalis*) stood out against the red rocks or the blue sky (Fig. 60). This tree is characteristic of the Steppes. The trunk owes its colour to the presence of a perfectly white dust, which comes off when rubbed by the hand; in fact the natives actually use it to whiten their head bands. We have never seen any trunk to equal this one in its intense whiteness. Patches of fig trees and the native orange (*Capparis Mitchelli*) and here and there groups of graceful Cycads (*Encephalartos Macdonnelli*) varied the scene (Fig. 59), but there was nothing like luxuriance ; not a trace of anything like an orchid, and the only ferns seen were two hardy species of Cheilanthes, growing in clefts and crannies amongst the rocks. Professor Tate discovered one interesting plant,

however, high up on Mt. Sonder, in the form of *Styphelia Mitchelli*. Its interest lies in the fact that, though more than one hundred and seventy species are known in Australia, this is actually the only one in the whole of the Central area. West Australia, with about one hundred and ten species, is the headquarters of the genus, but this particular one is a Queensland form, a relationship which is also noticeable in the case of other plants and animals.

Close by our camp was a dry watercourse called Red Bank Creek. Following this up towards the main range, the bed narrowed and the rocks closed in on either side, until, turning round a sharp bend, we found ourselves standing by the side of a small, deep pool of water blocking the entrance to a wonderfully picturesque gorge. For half a mile the gorge (Fig. 61), which is nothing more than a zig-zag cleft only a few feet wide, cuts its way right through the range. Its narrow bed is filled with water, deep and very cold. The sunlight falls upon it only for a short time at midday. On either side the red, jagged rocks rise precipitously and between them can be seen a narrow belt of bright blue sky. This is the most westerly of the gorges which form the most striking feature in the scenery of the northern Macdonnells. Later we saw more of them, but though all were picturesque, none were as imposing as this. At the present day the stream only runs for a very short time, perhaps only during a few days in each year, and denudation must be almost at a standstill. The top of Mt. Sonder, the western flank of which forms the eastern face of the gorge, is two thousand feet above the level of the water, and the stream must have worn its way down through at least this thickness of rock since first it began to flow.

We were a good deal interested in finding no fewer than six species of fish in one small water-pool close to

Fig. 61. RED BANK GORGE.

the entrance of the gorge. There were numbers of them also in the larger and deeper pool in the gorge itself, but this little hole measured only six feet in length and about three in depth. The water was perfectly clear and free of vegetable growth, and it was difficult to understand how the fish contrived to live. They could have had but very little to eat since the last flood time, and all of them were small in size. As a general rule the size of the fish in the water-pools of this region is roughly proportional to the size of the pool, or, in other words, to the quantity of the food supply available. The fish were as follows[1]—(1) a species locally known as the "bony bream" (*Chatoëssus horni*), the most abundant fish in the Central area. It varies from a few inches to about eighteen in length, according to the size of the pool. (2) A species of Therapon (*T. truttaceus*), silver-grey in colour with golden spots. (3) A smaller species of the same genus (*T. percoides*), not more than three inches long and easily distinguishable by its light silver colour and five strongly-marked dark bands, running vertically on each side of the body. Both these species were originally recorded from Queensland. (4) and (5) Two small and thin-bodied fish closely allied to one another, *Nematocentris winneckei* and *N. tatei*, with golden lines running longitudinally along the body. (6) A small but more stoutly-built fish (*Eleotris larapintæ*), yellow-brown in colour with some ten dark vertical bands on each side. The first five species were swimming about together ; and, as we noticed in other pools when we found the same fish swimming about in shoals, the little Therapon, with its dark bands, was the most prominent, but it was also the quickest in its movements and the most difficult to catch. When taken out of the water it made a small, but

[1] These fish were identified and described by Mr. A. Zietz. See *Horn Expedition Report*, Part II., Zoology, pp. 176 and 410.

quite distinct, trumpeting noise. The Eleotris did not often swim about with the others, but lay near to the bottom of the pool—usually, in fact, resting on the sandy bed. We only met with one other species of fish (*Plotosus argenteus*) in the waterholes amongst the Ranges. The six above-mentioned are widely distributed and are very characteristic of the region, no fewer than four of them being, so far as we yet know, confined to the Central area. When the rain falls and the flood waters from the ranges flow down the river beds on to the lower Steppes, they carry the fish with them to stock such water-pools as may remain for a longer or shorter time in favoured spots along the sandy bed, but sooner or later they dry up and the fish perish. Once, in the James Range, we saw a small pool, rapidly drying up, and then only a foot or two across and a yard in length, so crowded with small bony bream that we could lift them out with our hands. They could not move without touching one another. So far as we could ascertain no species has adopted, like the frogs, the habit of burrowing so as to tide over a dry season. This is to be associated with the fact that there is really no mud along the creeks, the beds of which are many feet deep in sand, which is not suitable for forming anything like a permanent burrow. Such mud as there is—though it is rather silt than mud—is to be found on the clay-pans, but these are away from the river courses and we never saw a single fish in them.

A day or two's work amongst the Ranges around our camp near Mt. Sonder showed us very clearly that we must, once and for all, abandon any hope that we might still have left of finding a rich, or even a specially interesting fauna and flora amongst the Macdonnells—at all events at that time of the year. A yard, in fact a few inches, away from the scattered water-pools every-

CENTRAL AUSTRALIAN LIZARDS.

Fig. 1. *Amphibolurus pictus.* Figs. 2 and 2A. *Physignathus longirostris.*
Fig. 3. *Ablepharus lineo-ocellatus.*

thing was as dry as possible. We turned up stone after stone and searched in every nook and cranny, only to find ants and scorpions and beetles, few in species but abundant in numbers. Lizards of course were more or less plentiful, geckoes and skinks of various kinds preponderating.[1] Far and away the most abundant was a species of Amphibolurus (*A. reticulatus*) with a dull yellow coloured body mottled with dark splotches. Other species of the same genus were amongst the most highly coloured lizards that we met with (Plate III). One (*A. pictus*, Fig. 1) had a band of bright blue along the middle of its back flanked on each side by bright red, the legs being blue. It looked exactly as if it were wearing two pairs of blue trousers. Another (*A. maculatus*) had the whole of its upper surface brilliant vermilion, with broken bands and spots of chrome-yellow and jet-black. So far as we know this is the only lizard in which the sexes can be at once distinguished by their different coloration. The male has a black patch covering nearly the whole of the throat, chest, and anterior part of the abdomen ; this, together with black bands along the sides of the body, is entirely wanting in the female. Of these three species the first was very often seen running about in the open, while the two others preferred the shelter of logs and stones, a fact which may probably be associated with the dull ground colour of the one and the brilliant coloration of the other two. A fourth species (*A. barbatus*), commonly known as the Jew lizard and widely distributed throughout the whole of the continent, was frequently met with sunning itself on

[1] For the identification of Lizards we are indebted to Messrs. Lucas and Frost, who have kindly identified the collections that were made, not only on the Horn Expedition, but on succeeding visits to Central Australia. *Cf.* Lucas and Frost, *Horn Expedition Report*, Part II., pp. 112—150. Plates 8-12, and Part I., p. 210.

the ground or lazily crawling about. It varied to a large extent in its coloration. On the open country round Charlotte Waters it had a general yellow-brown colour, similar to that of the ground and the withered grass. At Crown Point, on the Finke, the specimens were a curious brick-red colour, closely resembling that of the sand on which they were resting, but at Alice Springs they were all dull, almost black, though their surroundings were of a general yellow or red colour.

One of the most interesting forms was a representative of the genus Physignathus (*P. longirostris*). There is only one other species found in Australia and this inhabits the eastern and southern coastal districts, where it is never found away from streams. It is essentially a water lizard, spending its time on logs in and by the water, into which, when disturbed, it rapidly dives. The Central species (Plate III, Figs. 2 and 2A) is a very graceful, active creature, not usually more than eighteen inches in length. Its general body colour is a light blue-grey, except along the back where there is always a median light line with a darker and lighter brown band on each side. It darts about with great rapidity, often standing up on its hind legs as it runs, and catches flies and other insects with wonderful dexterity, so much so that, in some parts, the natives call it "amunga-quinia-quinia," which means "fly-quick-quick." It resembles its ally in the coastal districts in frequenting watercourses, where it lives amongst the debris on the banks. These watercourses at the present day are of course quite dry during the greater part of the year, but the habit may point back to a time when this species was also aquatic, and when the now dry creek beds were filled with running water.

The natives collect all of these lizards and eat them, and, needless to say—though their coloration may sometimes

protect them from attacks of other animals, so long as they remain quite still—it does not in the least protect them when the native is in search of food. In some cases the variation in colour within the limits of the species was most marked, and this without any relation to the surroundings or locality. Much the most variable in this respect was a small skink, one of the most widely distributed of all Australian lizards (*Egernia whitii*). In some specimens the general ground colour was a dull yellow-brown with a strongly marked continuous median black line along the back, discontinuous black lines and spots on either side of this, and light yellow or white spots irregularly scattered on the upper surface. In others the dark bands and spots were only faintly seen, the general colour being a dull yellow-brown with indistinct darker bands and spots ; but side by side with these dull coloured specimens were others in which the whole upper surface was brick-red in colour. It is very difficult to account for the wide range in colour of this particular species. Others have seasonal changes, but in this species the variation has nothing to do with the season. On the other hand, more especially in the case of species of the genus Amphibolurus (such as *A. pictus* and *A. maculatus*), there was a notable difference in the degree of coloration of specimens, some collected during the ordinary dry season and others a short time after the fall of rain. We could hardly believe that the brilliant red, vermilion, orange, chrome-yellow, blue, and black lizards, which were busy gorging themselves with food after the fall of rain in January, 1895, were identical in species with the uninteresting-looking animals which we had captured in the same part of the country during the dry months of the preceding year, and exactly the same was true of the frogs.

After a short spell in our camp near Mt. Sonder we came to the conclusion that the best plan to adopt was to follow down the Finke River. This would give the geologists—Professor Tate and Mr. Watt—another opportunity of making a traverse of the Ranges from north to south, and as for those of us who were interested in other branches of science, well, we felt that things could not be much worse or more unpromising. Our plan was to travel eastwards at the base of the main ridge until we struck the Finke, which is formed by the union of three creeks, the Davenport, the Redbank, and the Ormiston. These three run through the main ridge from the water-shed, lying to the north. The Redbank junctions with the Davenport, which then flows eastwards until it meets the Ormiston, and then the Finke, thus formed, turns abruptly south, passing in succession through three gorges, of which the northernmost and also the most abrupt is called the Finke Gorge. It is gorges such as these which afford the only method of passing across the Ranges, but when, as happened at the time of our visit, any particular one is blocked by a pool of water, a long detour has often to be made to find a dry one. We had to go twenty-five miles round, retracing our steps until we could cross the Ranges, and finally we camped on a slight rise in the Horn valley not far from the south of the Finke Gorge.

From our camp we could work along the Horn valley, east and west. We could also work north and south along the gorges, except that the entrance to the northern one was blocked by a pool of water about twenty or thirty yards wide, from the margins of which the red rocks rose abruptly. The southern gorge was considerably wider, and the sandy bed of the river was bordered by steep banks covered with scrub, behind which, again,

rose the cliffs. The few pools in the bed of the river were decidedly brackish, though they were fringed with reeds and contained the same kinds of fish that we had already caught in the Red Bank. The only fresh water was a small spring on the steep western bank of the southern gorge, and around this there was actually a patch of black earth—the only one that we had so far seen, and one of the very few that we met with during our whole journey. In this, and in a similar patch further south, we found the only earthworms which are as yet known to exist in Central Australia. All through our expedition we searched for earthworms in every likely and also unlikely spot, but found them nowhere, except in these two places. Each of these patches of ground measured only a few square yards in extent, and from this, some idea of the remarkably local and sporadic distribution of animals in Central Australia may be formed. The worm (*Notiodrilus eremius*) is of great interest because it belongs to a genus which is found in only a very few parts of Australia, widely separated from one another. We now know that it occurs in West and Central Australia, Queensland, and New South Wales. It belongs to a genus of worms characteristic of New Zealand, and found also at the Cape of Good Hope, in Madagascar, in Kerguelen and Marion Islands, on the Falkland Islands, and, somewhat widely scattered, over South America. It is evidently one of those forms which entered Australia by way of a land-bridge stretching northward from New Zealand, or rather from the land mass of which what is now New Zealand once formed a part. By way of this, a certain number of animals appear to have migrated into Australia, not directly from New Zealand, but first of all, into the Papuan region, and then south by means of a land connection across the present

site of Torres Strait. A very remarkable feature is that only this one genus of earthworms should be represented in Central Australia; and we may feel perfectly certain that it is native and not imported there. The eastern and south-eastern parts of the continent are wonderfully rich in species of earthworms, and it is strange that not one of the characteristic Australian genera should be met with in the Centre. Professor Benham comes to the conclusion that the first Acanthodrilids, of which Notiodrilus is one, entered Australia from the north-east, and that subsequently the forms of earthworms which are now so characteristic of the continent, entered also from the north-east and gradually drove out the more primitive Acanthodrilids, leaving a few species stranded in different parts of the continent. Even so insignificant looking an animal as a little worm like this *Notiodrilus eremius*, not more than two inches in length, may form a very important piece of evidence in regard to the former distribution of land in the old Australian continent before the present age of desiccation set in, and may also afford some clue as to the length of time over which this desiccation has extended. It could not possibly travel now, across the wide stretches of inhospitable country which separate it from its allies on the east and west. Such travelling must have taken place when the Central area was well watered, and at a time prior to that at which the earthworms, now characteristic of Australia, had arrived upon the scene, or else they also would have found their way across. That they are absolutely unrepresented in Central Australia is very clear evidence of the fact that they came into the continent, or perhaps even were developed there, in some instances, from older Acanthodrilids, after the Centre was climatically isolated, so far as earthworms are concerned.

We spent two days camping in the Gorge with only poor results, and then moved south again, following the Finke out on to the Missionary Plain until we came to a number of dilapidated buildings representing what had once been a Lutheran Mission station, but was then deserted and fast falling into ruins.[1] There was one white man in charge of the place, and the natives were scattered. In this part, as at Tempe Downs, the members of two tribes foregather—the Arunta and the Luritja. The former occupy the greater part of the Macdonnell Ranges, and the latter, an abnormal tribe about which very little is known, are scattered thinly over the poor country to the west and south of the Central Ranges. The Luritja met with at these places are really visitors, but they are quite friendly with the Arunta, though the latter look down upon them as an inferior people. The broad Missionary Plains, here about ten miles across, were very uninteresting. There was nothing but a sandy flat with gum trees along the river bed and a thin scrub of cassias, Hakeas, Grevilleas, and acacias of various species. Looking south from the old Mission Station, built on a high bank along the Finke, we could see the river trending south to the James Range (here called the Krichauff) a mile or two away. It seemed as if it simply ran up against the hills which rose abruptly from the plain and ended there, but in reality it enters a gorge and runs right across the range, winding and twisting about until, forty miles to the south, it once more emerges and slowly meanders over the great Cretaceous plain towards Lake Eyre. In 1872 Ernest Giles discovered this remarkable gorge and found in it a small colony of palm trees, the only ones of their kind existing in Central Australia. It is curious and interesting to follow down

[1] This has since been re-opened.

the course of the Finke River. Starting in the north, we have the three little streamlets already referred to—to the west the Davenport, in the middle the Red Bank, and to the east the Ormiston. Each of these cuts its way in a deep gorge straight across the main range of the Macdonnells; as soon as it has done so the Davenport turns east, and is shortly afterwards joined by the Red Bank; the stream, still small, junctions with the Ormiston, and the Finke, thus formed, turns southwards and cuts in a second series of gorges across the two ridges bounding the Horn Valley. To the south of these it has clear running across the Missionary Plain, receiving every now and then a small branch, such as Rudall Creek, but making no attempt to flow along the valley east and west; in fact it seems as if it were hurrying on towards the hills which arise abruptly from the plain. It is a pity that the name of Finke Gorge has been applied to the smaller northern one, and not reserved for the really remarkable one by means of which it crosses the James Range. On its eastern bank it is joined by the Ellery, the course of which is closely similar in essential features to that of the Finke itself. On the west, flowing in from a short lateral valley, is Palm Creek.

We entered the main gorge some two miles to the south of the Mission Station, and followed its windings for ten miles between lofty, picturesque cliffs of red sandstone, which sometimes hemmed the river in closely, but at others receded, leaving room for banks of sand covered with scrub. At intervals side streams came down through lateral gorges which they had hollowed out for themselves. Most of these streams were small; in fact the only one of any considerable size was Palm Creek. There were a few pools of water, and on one of these we counted a flock of nearly seventy teal and duck. We camped first

Fig. 62. PALM TREES (*Livistona mariæ*).

of all at the entrance to Palm Creek at the foot of a clump of fine gum trees and palms with a picturesque background of rock (Fig. 62), broken into great red blocks, piled one upon the other so as to form lofty pinnacles. Next morning we wandered further on down the main stream. There were a few scattered palm trees, about a dozen in all, but not a sign of a young one. Several hours were devoted to a search for land shells, which are by no means easy to find in dry regions unless you know exactly where to look for them. Heaped up along the side of the gorge was a talus of material, weathered and broken away from the cliffs above. It is now covered with fig trees and smaller shrubs, such as Indigofera, but everything is so dry that you would not at first think that so tender-bodied and damp-loving an animal as a snail could possibly exist. We set to work, lying down under the shrubs, and, by dint of carefully scraping away the loose earth under the dead leaves around the roots, found several species, one of which, a bulimnoid shell (*Liparus spenceri*), was new. Some of the species were so small that in order not to miss seeing the specimens we had to search through the debris with the point of a small knife-blade. Though we searched with equal care in many other parts of the Centre, we only met with this one small colony, confined to a few square yards under the shelter of the fig trees on the banks of the Finke, another instance of the sporadic and extremely limited distribution of many animals and plants in this region.[1] The next day we shifted camp and went westwards up the bed of the Palm Creek. At first the gorge was comparatively open, but, after traversing two miles, the hills closed in and formed a fine semi-circular sweep of red, precipitous cliffs which

[1] For a description of the Mollusca of this region see Tate in *Horn Expedition Report*, Part II, p. 181; also Hedley *loc. cit.*, p. 220.

rose abruptly from the rocky bed of the river. On the northern side the rocks were covered in their lower parts with a thick growth of Cycads, while an odd palm or two had managed to establish themselves in clefts right in the rocky bed.

Passing out of this Cycad gorge, the valley opened a little where a small stream came down from the south, but soon closed in again to continue as a long, winding gorge leading back amongst the hills. A little way up this we fortunately found a sandy patch, just large enough for us to camp on, for everywhere else there was nothing but hard, smooth rock with cliffs rising abruptly on each side. A few yards from our camp lay a pool of water surrounded with rushes. On the north side of this, sheltered by the hill, was a belt of scrub and, rising above this, the palms stood out (Fig. 63). Almost all of them were on the north side of the gorge, and there were very few except those in this one place. All told, it is doubtful if there were more than one hundred adult plants at the time of our visit. A very surprising feature was the great rarity of half-grown plants. There were a fair number of small seedlings, a foot or so in height, growing amongst the clefts in the rocks. This would seem to show that the great majority of these young ones must be torn out and carried away at the rare times when a flood comes down the gorge. There is no sand or soil in the gorge, except the small amount which finds a safe shelter in cracks and crevices, in which the seedlings live ; and, judging by the heaps of debris piled up against the tree trunks, the flood waters must come down with considerable force. Seeds are there in plenty and must be washed down in considerable numbers into the main channel of the Finke. It would naturally be thought that they would germinate there, but evidently there is

Fig. 63. PALM CREEK.

something which acts as a check. It may be partly the absence of sand or soil, and partly the fact that the drying-up waters of the Finke are often decidedly brackish.[1] At all events there was not a single seedling to be found along the main Finke valley, though they were numerous in the Palm Creek gorge. A photograph such as the one reproduced, with its imposing pool of water (really only a small one) and its group of palms rising above the scrub, almost conveys the idea of a semi-tropical scene ; but in reality there is none of the damp luxuriance characteristic of tropical life and, as usual, a yard away from the pool everything is as dry as possible.

This particular palm (*Livistonia Mariæ*) is closely allied to the common cabbage palm (*L. australis*) of many other parts of Australia—more especially the coastal districts of the east and the south-east, and it is evidently, as are many other Central animals and plants, a relic of a species which was once much more widely distributed than it is at the present day. It is safe to say that it exists absolutely nowhere else except in this one spot.

We spent three days at Palm Creek, and as the animals and plants of this part are very characteristic of those of the Higher Steppes, it may be worth while noting a few of the more important ones that we found here and in the neighbourhood. Amongst mammals, rodents were represented by a little mouse (*Mus hermannsburgensis*), a new species.[2] There were one or two other species of Mus, but undoubtedly the characteristic rodents of the Centre are the long-legged, jumping, Jerboa mice. We

[1] A large number of seeds which we brought down to Melbourne germinated readily, and produced thriving seedlings.

[2] For the identification of these *cf.* Waite, *Horn Expedition Report*, Part II., p. 393. For nomenclature see also Thomas, *Ann. Mag. Nat. Hist.*, Sec. 7, vol. xvii., p. 81.

found a new species, the size of a rat, called *Ammomys pedunculatus*, characterised by the remarkable nature of its tail. For a short distance from its origin it is about four millimetres in diameter, then it suddenly swells out to twice this size and remains so for some distance, after which it very gradually tapers off. The tail is remarkably brittle and pieces snap off easily when it is handled, so much so that it is difficult to secure a perfect specimen. It is widely distributed over both the Higher and the Lower Steppes. Rodents are far more abundant than the smaller marsupials, and in addition to the indigenous ones, the imported *Mus musculus* has now made its way into the Centre. Periodically one species will appear in enormous numbers, forming migratory hordes. In 1895, for example, Mr. Byrne, writing from Charlotte waters, said "the Jerboa-like rats[1] are coming from the eastwards and they almost amount to a plague here." These periodic migrations of rats are well known in many parts of the dry interior of Australia. They march on and on along a definite route, as the Lemmings do in Europe, appearing and disappearing almost suddenly. Those which escape the birds of prey that follow them probably perish finally from lack of food and water, for impelled by some instinct they march straight ahead, utterly regardless of whether there is food or not.

Amongst the marsupials the large red kangaroo (*Macropus rufus*) is constantly seen during good seasons on the open flats, the euro (*Macropus robustus*), a smaller animal, being confined to the rocky hill-sides, never descending to the plains, just as the larger one never affects the hills. Formerly the euro of South Australia and the wallaroo of New South Wales and Queensland

[1] In this instance the rat was *Notomys cervinus*.

were regarded as distinct from one another, but the difference between the two appears to be one of colour only, the euro having a decidedly reddish tinge, the wallaroo being grey in colour though intermediate variations apparently occur. In the Centre every specimen has a very distinct ruddy tinge. These larger kangaroos vary very much in number according to the season. In the great drought which preceded the year 1901, thousands of them must have perished. How severely they are affected by bad seasons may be judged from the fact that during the whole of the time spent by us in 1901 in traversing the Centre from Oodnadatta to Powell Creek we actually saw only two specimens of the larger lowland form (*M. rufus*). Along with the euro, and more abundant than this, we found many rock wallabies (*Petrogale lateralis*). These have definite "runs" along the hill-sides and are often to be seen scampering away at a great speed. On the George Gill Range rock surfaces along these runs were, in places, highly polished by continuous friction of the feet of these wallabies. Their body is about two feet long and they can be recognised at once by the light line which runs along each side of the body. Though usually spoken of as the Western Australian rock wallaby, this marsupial is very characteristic of the Central ranges, in fact it was the one which we saw most frequently. Four of them that we examined were females, and in each case the pouch contained only one young one, so that evidently this is the typical number. That the number of young ones is so small is probably closely associated with the fact that the animal spends its life clambering about amongst the steep hills, and as the young ones grow to a considerable size before they leave the pouch, the mother would be very seriously handicapped if she had to carry

more than one at a time along a steep hill-side where there is but little shelter and where birds of prey, such as the wedge-tailed eagle, are constantly on the look-out for food.

On the flats amongst the ranges one of the hare-wallabies was sometimes met with. Its popular name, as usual in the case of very many Australian animals, is rather fanciful. Its only resemblance to a hare lies in its size and colour, though it is usually larger than a hare and its fur is decidedly coarser. It is a nocturnal animal, as are the great majority of the smaller marsupials, and therefore they are very difficult to secure. This particular species (*Lagorchestes conspicillatus*) is known as the "spectacled" wallaby, because it has a well developed band of chestnut colour round each eye. On the same sandy flats we also found one of the "nail-tailed" wallabies (*Onychogale lunata*). The most remarkable feature of these animals, which have a total length (body and tail included) of about three feet, is that they have a curious horny spur on the end of the tail which is only known elsewhere amongst mammals in some specimens of lions. Unfortunately we never secured the animal alive and the use of the little spur, which is really only a small blunt knob, is quite unknown. Probably it has none. It is difficult to imagine any use to which it could be put.

One of the most interesting, and also one of the rarest of the smaller, in fact diminutive, marsupials, is the little so-called jumping, pouched mouse (*Antechinomys laniger*).[1] It is a very pretty, graceful little animal, but only superficially like a mouse. In the first place its head is long and pointed, and its teeth are adapted for

[1] Mr. Oldfield Thomas has since described this Central Australian form as a new species under the name of *A. spenceri*.

eating insects. Its body measures from three and a half to four inches in length, and its tail from five to six inches. The latter is slender with a tuft of black hair on the terminal inch. Its hind legs are very much longer than its fore legs ; in fact the latter are not used in ordinary locomotion any more than are those of a kangaroo. Apart from the fact that it is very rare, its strictly nocturnal habits are against its being seen. One bright moonlight night, while sitting quietly out in the open on a stony plain near Charlotte Waters some little distance from the camp, where all was perfectly quiet, our attention was drawn to a little animal which was darting about. Its movements were so rapid that, until it came close to us, we could not tell what it was, but then we saw at once that it was an Antechinomys. The little creature was evidently curious, and as we remained perfectly still, it jumped about, first to one side and then to the other, stopping every now and then to look at us. It stood on its hind legs with its body nearly erect and its tail curved upwards, so that it did not actually touch the ground. In proportion to its size, the space of ground which it covered when jumping was remarkable. Its movements were so rapid that they were difficult to follow. It would perch itself on a stone, stand erect and look at us, and then, like a flash, it leaped away for at least six feet. It lives side by side with the Jerboa mice, but for some reason which it is difficult to understand, it does not seem able to flourish as the mice do.

The only way to procure many, indeed most, of the smaller marsupials is by the aid of the natives, who are perfectly well acquainted with their habits, and not only know where they hide or burrow, but from a slight examination of the sand at the entrance, will tell you at

once whether the owner of the burrow is at home or not. All the animals, except the very small ones, are useful to the native for food, but some of them, in addition, provide him with material which he uses for ornament. Almost every native has one or more tassels, which are worn hanging down over the forehead or suspended from the waist girdle, and are made from the tail tips of the rabbit-bandicoot (*Peragale lagotis*). Its popular name of "rabbit" is due to its large ears; otherwise, apart from the fact that in size it approximately resembles a rabbit, it has no resemblance to this animal at all. It has a very long, pointed snout, with numerous small front teeth and strong canines, and feeds on vegetables, insects, and grubs. The fur is long, silky, soft, and generally grey-coloured with here and there a rufous tinge, save on the under side of the body, where it is white. The ears are almost naked and consequently the blood vessels give them a pink tinge. The most striking feature, however, and the one which gives the animal its value in the eyes of the natives, is the tail. The basal third is grey, the middle third black, and the terminal third is marked by a prominent crest of white hairs on the upper side. The natives only use the latter. They cut off the flap of skin which carries the crest and twist this round and round in such a way that it forms a little brush of long white hairs. Sometimes as many as twenty of these brushes will be tied together to form the tassel which, as also the little brush itself, the natives call "alpita." In many parts of the Centre, the burrows which this bandicoot makes are very extensive, the animal living in colonies. Each burrow has an entrance two feet or more in diameter, and around this the sandy soil is raised into heaps. Judging by the supply of alpita in every native camp, this bandicoot, or

Phascologale macdonellensis.

"Urgatta" as the Arunta natives call it, must abound; and it must also be a prolific breeder, otherwise the constant depredations of the natives would have exterminated it. It spends the day-time asleep right at the end of its burrow, from which the natives dig it out. When alive it is a very pretty, graceful and delicately coloured animal, and its fur is much the most silky and soft of all the marsupials.

Amongst the ranges we also secured a new species of pouched mouse (*Phascologale macdonnellensis*) with a remarkably swollen tail, due to the deposition of a mass of fat and elastic tissue. The use of this is unknown, and it is present at all seasons of the year. The little animal is by no means easy to secure, as it lives amongst the hills under blocks of stone; also it is nocturnal. The first specimen we saw was caught by a cat at Alice Springs, and subsequently we were able to see one or two alive which had been caught by the natives (Plate IV).

Amongst the birds the most interesting one to be found in the Central area is the Princess Alexandra parrakeet. This was originally described by Gould in 1863, having been discovered by Waterhouse during McDouall Stuart's third expedition in 1861, when he succeeded in crossing the continent from south to north. It is the most beautiful and delicately coloured, as it is the rarest, of our parrakeets. It belongs to a small group characterised by the length and narrowness of the tail feathers, which add to their graceful appearance, as compared with other parrakeets. The natives call it "Inilturung," which means "long tail." A fully-grown bird has a total length of seventeen inches, of which the tail forms more than eleven. Delicate shades of rosy and coral pink, moss-green, cobalt blue, with darker shades of brown and blue, blend together in such a way as to render the bird much less garish in its

colour than most of our parrakeets (Plate V). At the time of the Horn expedition it was only met with once, far away in the western Macdonnells, when Mr. Keartland, the ornithologist of the party, most fortunately came across a flock of about fifteen, perched in a small clump of "desert oak." This was in June 1894; in November of the same year they made their appearance in the eastern Macdonnells, nesting in hollow limbs of gum trees, each nest containing five white eggs. Then for years they seemed to disappear until, once more, they were recorded during the year 1905 from as far south as Oodnadatta. They feed on grass seeds, more especially those of the porcupine grass, which indicates that they normally inhabit dry and sterile country such as is avoided, as far as possible, by man. They certainly have a most remarkable habit of never appearing in the same part of the country during two successive years; in fact, when they do come, they make their appearance suddenly and disappear as suddenly and mysteriously, but whence they come and whither they go no one knows.

Another little parrakeet which we often saw amongst the ranges was the warbling grass parrakeet (*Melopsittacus undulatus*). It always flies in flocks, each of which will contain perhaps two or three hundred birds. They come flying towards you and suddenly, as if seized by some common impulse, they turn abruptly in their flight and you see a momentary, brilliant glitter of golden green as the sunlight flashes on their backs.

Amongst the pigeons two or three species seem to be especially fond of rocky country. One, popularly called the rock pigeon (*Lophophaps leucogaster*), has a curious habit of lying close to the ground. Apparently it never perches in trees, and so long as it remains quiet, it is very difficult to detect amongst the sand and loose stones, the colour of

PRINCESS ALEXANDRA PARAKEET *(Spathopterus Alexandræ).*

$\frac{1}{3}$ nat. size.

which it closely resembles with its yellow and brown markings. Often our horses or camels would put their feet down within a few inches of the birds, when they rose with a whirr and then glided quietly away for thirty or forty yards. The crested bronze-wing (*Ocyphaps lophotes*) was common and very often met with near waterholes both during the day-time and at evening. They fly about in small flocks and, when coming in to drink, alight on the ground near the water and then, forming a procession, run down singly to the pool. One day, sitting quietly by the side of a waterhole in the bed of Rudall Creek on the Missionary Plain, during our mid-day halt, we watched more than twenty of these birds alight on a rocky bank on the opposite side of the pool. They spent a few minutes preening themselves and then, one after the other, ran down a little track which they had worn for themselves to the water's edge. There was never more than one bird drinking at the same time. As soon as each one had finished it ran up to the top by another track, while a second bird ran down the old track. They waited for one another on the top of the bank and, when all had been to the water, they gathered together and flew off.

There are, amongst the smaller birds in Australia, none which are more lovely than some of the superb warblers—that is, the males in full plumage; the females and young males are very drab coloured, the male only attaining his full plumage when quite mature. Three different species inhabit the Ranges, of which the one called the black-backed warbler (*Malurus melanotus*) is perhaps the most beautiful, with its brilliant cobalt-blue throat and under surface and a band of velvet-black across its chest. Lambert's warbler (*M. lamberti*) is also very striking on account of the presence of a patch of cinnamon-brown,

edged with deep cobalt, on the top of its head. As usual the birds go in small flocks which are often composed of two or even three species. Each flock will have a few fully-developed males and a large number of females and immature males. They prefer dense undergrowth, the males especially keeping under shelter, as otherwise their brilliant and sparkling colour would at once attract the attention of the hawks which are always hovering about.

Lizards and fishes we have already referred to, and there was nothing of special interest about them at Palm Creek, except that in the water-pools we found the same six species of fish that we had previously caught at the Red Bank Gorge. Insects both here and elsewhere were very disappointing; in fact there is only one time in Central Australia when insects are really abundant and that is just at the time of a heavy rainfall. During our three days at Palm Creek we only collected forty-seven species, of which however, twenty-five were new ones, but there was not a single attractive one amongst them; all were small in size and dull in colour. The most surprising feature in regard to them was the very small number that we secured on flowering shrubs. In some cases the cassia shrubs were brilliant with masses of yellow blossom, but there was not a single insect to be found amongst their flowers, with which may be associated the fact that very few seed pods were produced and those that there were contained only ill-formed seeds. The only beetles really abundant were a few species of Curculios, or weevils, some of them clinging on to the twigs of the shrubs, others hiding in cracks on tree trunks. A little Carab of the genus Tachys, a small black and a larger black-and-red species of Staphylinid, or devil's coach-horse beetles, were always met with under stones

by the side of waterholes ; in fact we got quite tired of seeing these and usually no others.

We spent some time investigating an animal locally known as the "booming" or "barking spider," the latter being its usual name. There were certainly spots where the noise could be heard, and the evidence in favour of its being made by the spider consisted apparently in the fact that the noise had been heard at night, and that on examining the spot next morning burrows containing the living spider had been found. Probably also the great size of the spider had something to do with the curious belief. We spent a night out in the scrub, sleeping on the ground where the noise could be heard, and came to the conclusion that it was made by a bird—almost certainly a quail, which is abundant just after a rainfall, when also the settlers say that the spider "booms" or "barks" most. The noise is certainly not made by the spider, which proved to be a species of Phlogius living in burrows. There was a hole about an inch in diameter leading into the burrow, which ended, about a foot and a half below the surface, in a small spherical chamber in which the spider rests during the day-time.

We kept some in captivity, and one day, when teasing a large one with a piece of straw, it raised its body up and, rubbing its palps against its mandibles, made a slight but distinctly audible whistling sound. Examination revealed the fact that it had a series of spines on the mandible that could be rubbed across rows of keys on the palp, thus making the noise, which is quite likely much more audible to many other animals than it is to human beings.

Amongst the plants, in addition to the palm and cycad and the pine which grows on the hill-sides, the most

characteristic are those which inhabit the gorges and take root amongst the piles of broken rock fragments which form the talus beneath the steep escarpments of the Ranges. The chief amongst these are species of Ficus, Capparis, Hibbertia, Indigofera, Tecoma, Cassia, and Eremophila, all of which form shrubs ; while amongst the smaller herbaceous plants are species of Ptilotus, Crotalaria, Aster, and the ever present Triodia or porcupine grass. Out of seventy flowering plants which we collected growing upon the Ranges, no fewer than sixty-three are confined to this Central area of the continent. Yellow was the prevailing colour of the flowers, though every now and then large patches of white or pink everlastings (*Ptilotus sp.*) gave a little variety to the usually dull scrub, and a small cluster of red Hakea or mistletoe blossoms caught the eye, simply because any colour, other than the prevailing monotonous dull green, was welcome. The only trees which really reach any height are the palm, which is from fifty to eighty feet high, and the gums, of which, as usual, the red gum (*E. rostrata*) is confined to the beds and banks of the streams ; on the other hand, *Eucalyptus terminalis* grows right on the Ranges, and, with its dazzling white trunk, forms a very characteristic feature in the vegetation. Though it seemed rather like desecration, we cut down one palm, as we were very anxious to find whether, as in other parts of Australia, the sheathing leaf stalks harboured any special form of animal, such as snails or land Planarians. After carefully removing and examining every leaf and its stalk, our efforts, spread over three hours, were rewarded by the finding of one cockroach and one bug. It was only one of the numberless times on which we realised that Central Australia was far from being a happy hunting-ground for the zoological collector, and, what was more disappointing still, was the

fact that very few animals had adopted any special provision to enable them to persist under most trying circumstances of heat and drought. For the most part it was simply the case that if an animal were hardy enough to tide over bad times, then it did so—only very rarely indeed, as in the case of the burrowing and water-holding frogs or the operculum-forming snails, was there any attempt made on the part of the animals concerned to adapt themselves, in any special way, to a dry climate.

Except the palm and the gums, the trees are only small ones, though occasionally an *Acacia salicina* may reach a height of forty or fifty feet. On the Missionary Plains we now and again saw small groups of this species, which is certainly the most graceful of all the acacias in the Centre. On some trees the leaf stalks, which are flattened out and take the place of leaves, are thin and long, and hang down below the level of the twigs, leaving the latter bare above, giving the whole tree a striking resemblance to a weeping willow. In other cases the tendency of the phyllodes to hang pendant was only very slightly marked. The Hakeas, Grevilleas, mulgas, mallee gums (*E. oleosa*) were all relatively small—perhaps twenty feet at most. The cassias and Eremophilas were mere shrubs, though often refreshingly bright with flowers.

After spending three days in our camp at Palm Creek we retraced our steps along the Finke to Hermannsburg, where we joined the main party of the Horn Expedition, and then together with the camel team struck north-east until we came to the Ellery Creek. At this point, in company with Mr. Winnecke as guide, we again left the main party, intending to travel right across the ranges to the Burt Plain in the north, the main party tracking eastwards along the valley to Alice Springs. Our first night

we spent at a dry camp, but the second day, late in the afternoon, we got into a regular jumble of low hills covered with porcupine grass, which from a distance gave them the same Down-like appearance that had struck us before when we were approaching the far western continuation of the same hills on our journey north from Lake Amadeus. By good fortune, for it was just getting dusk, we found a little spring of water issuing from the conglomerate rock of which the hill was composed. The water was quite warm and only filled two little pools each a yard long and an inch or two deep, and then disappeared. The camels did not matter, but fortunately there was enough to water the two horses which we also had with us, and for this we were thankful and lay down to sleep in a patch of Ti trees by the side of a dry creek. Next morning we climbed the hill behind our camp to obtain a general view of the country. To the south of us lay the Missionary Plains stretching away westwards to the horizon. They, in their turn, were bounded on the south by the James Range, which we had left two days ago. Eastwards the latter range trended towards the north, so as gradually to narrow in the plain, across which a far distant streak of gum trees marked the course of the Hugh River. Looking to the north we found that we were on the ridge forming the southern boundary of the Horn Valley. It was not more than a quarter of a mile wide in this part, and above the ridge which enclosed it on the north we could see the main Macdonnell Ranges stretching away, east and west, with Paisley and Brinkley Bluffs and Mt. Conway standing out conspicuously. We were fortunate in finding a way across the comparatively low ridges hemming in the Horn Valley on the north, and passed out on to a long plain, here about three-quarters of a mile broad, with great masses of gneissic rocks projecting every now and then. It ran east

Fig. 64. PAISLEY BLUFF.

Fig. 65. SPENCER GORGE, MACDONNELL RANGES.

and west, and ahead of us was the main ridge of the Macdonnell Range, across which, somehow or another, we had to find a way. First of all we travelled east, crossing one or two branches of the Hugh River as it came down through the Ranges from the north. We thought it possible that there might be some gorge at the base of Mt. Conway which would allow us to pass through, but could find no feasible route. The ground was very rough and broken, and travelling was not easy. Finally we gave up the attempt and retraced our steps, following up one of the branches of the Hugh, until we camped by the side of a very picturesque pool near the base of Paisley Bluff, in just the same relative position to the main range in which we had camped by the Red Bank Creek near Mt. Sonder. It was a delightful camp, all the more so because there was no difficulty in regard to water, and at night, as we lay on the sand in the clear moonlight, we could hear the Mopokes calling to one another in the gum trees and see the dingoes sneaking round our camp, evidently anxious to come in to water but frightened to do so (Fig. 64).

We gave the horses and camels a day's rest and ourselves the chance of a little collecting, but as usual it was disappointing. The hill-sides were studded with pines and cycads, and in a narrow gorge at the base of Paisley Bluff we saw the first examples that we met with of the paperbark Ti tree (*Melaleuca leucodendron*), the popular name of which is derived from the fact that the bark peels off just like sheets of paper—in fact the natives use it for wrapping up their few belongings. The gorge was hemmed in by precipitous cliffs, and the small space forming its floor was filled with white-stemmed gum trees, Ti tree, cassias, and Grevilleas (Fig. 65). Cycads and pines studded the hill-sides, and great rough masses of rock

which had tumbled down blocked the passage, so far as horses and camels were concerned.

It was in this gorge that we found the first examples of a new species of honey ant, of which Mr. Cowle, at a later time, found many more specimens. The nest consisted of a series of burrows branching off in all directions and opening up under a small block of quartzite. The bodies of the honey ants were decidedly inflated, but nothing like so much as in the case of the more common species (*Melophorus inflatus*). The insects were even capable of moving about to a certain extent. We tried to examine the nests of two other species of ants which are very characteristic of the whole of the Central area, from Ayers Rock in the south to the Burt Plains in the north. One of these has the form of a mound upwards of two feet in diameter and about six inches high, with a large crater-like depression at the top. The ants arrange a thick deposit of the long, dry phyllodes of the mulga tree so as to cover the dome. They are all placed in a perfectly radial manner, and give the nest a most characteristic appearance. The other nest had a mound of the same size, but instead of a crater opening, it had a slit, five or six inches long and half an inch wide. The mound was covered with an enormous number of grass seeds, every one of which must have been brought in separately by the insect, which is one of the many species of the genus Camponotus (*Camponotus denticulatus*). We spent some time trying to investigate the nest, but the ground was as hard as stone and the insects, which were one-half or three-quarters of an inch in length, disliked being disturbed. There did not appear to be anything like a fungoid growth amongst the leaves or seeds, or anything that we could see which would be of service to the ants, though such might of course be present under different conditions in regard to moisture. Often these

two kinds of nests would be close together, but the one always had nothing but mulga leaves and the other nothing but grass seeds.

Finding that we could not get through the Ranges at Paisley Bluff we travelled on to the east until we struck another branch of the Hugh River, and following this up to the north, came to a gorge through which the stream had cut a path for itself at the base of Brinkley's Bluff. The bed of the creek almost completely filled the gorge, and there was only just enough room for us to pass between the pool of water and the rocks which hemmed it in on each side. We were now to the north of the main ridge, and further again to the north of us, there was nothing to be seen but a long succession of low irregular hills all jumbled together. We wended our way in and out amongst them all day long, for we had to cross them before we could reach the Burt Plain. Between five and six miles to the north of the main ridge with its lofty peaks and bluffs we crossed the watershed, though we only knew that we had done so because such little streams as there were trended northwards instead of southwards. Just at sunset we came to a high gneissic range up which we led the camels with considerable difficulty, as there were ugly ledges of rock to be climbed ; but to our relief when we reached the top we saw the broad, scrub-covered Burt Plain stretching away to the northern horizon. On either side of us, to the west and to the east, the Macdonnell Ranges swept in an unbroken line as far as we could see. A flock of more than fifty black cockatoos, disturbed by our appearance, were screeching loudly overhead, showing us that water was not very far away. Zig-zagging very carefully down the steep face of the hill, we at length succeeded, after much careful work, in getting our camels safely down, and camped at dusk in the soft sandy bed

of a creek. All the next day we travelled eastwards, skirting the northern edge of the Ranges until we saw the overland telegraph line coming south across the Burt Plain. After camping for the night we once more turned south into the Ranges (Fig. 66), and reached Alice Springs, the central station on the telegraph line.

The station is built about a mile and a half to the north of the main ridge of the Macdonnells, which at this point is insignificant in height, but away to the west Mt. Conway and other peaks can be seen rising from it. To the south of this ridge there is a broad flat valley, on which the little township of Stuart is built. It consists, or did at the time of which we write, of two or three stores and the inevitable bush hotel. Camel teams often pass up and down the telegraph line, bringing stores to the township, telegraph station and outlying cattle runs, and there is usually a mob of camels with their attendant Afghans camped out in the scrub. This valley is a continuation of the one which lies at the base of Mt. Sonder, and to the south it is bounded by a high ridge which forms the most prominent feature in this part of the country. The top of the escarpment is fully three thousand feet high on Mt. Gillen, the native name of which, in allusion to the fact that it stands out above all the other peaks and ranges round about, is Okniambanta or the "great father." On its northern face it has a bold precipice three or four hundred feet in height (Fig. 67). Its southern side is not so precipitous, but is still very steep and slopes down into a wide valley, the eastern continuation of the Horn Valley. To the south of this comes another ridge and then a broad valley, continuous westwards with the Missionary Plains. The Todd river takes its rise some distance to the north of Alice Springs, and after winding about amongst the relatively low hills forming the watershed, it cuts south across the

Fig. 66. AMONGST THE MACDONNELL RANGES.

Fig. 67. DISTANT VIEW OF MOUNT GILLEN, SHOWING ALSO THE BED OF THE RIVER TODD WITH ITS FRINGE OF GUM TREES.

successive ridges in gorges, just as the tributaries of the Finke and Hugh do further to the west. Its deepest gorge, called the Heavitree, lies at the base of Mt. Gillen. Except at the very rare times when the bed of the river is filled with flood waters, this gap forms the only means of traversing the Ranges in this part, and through it runs the line of telegraph poles carrying, at the time of our first visit, the single wire which then served to connect Australia with the outside world. In those days, now seventeen years ago, if any accident happened to this single thread of wire, Australia was telegraphically isolated. A few years later another wire was added and all the wooden poles—which were very liable, especially in the more northern parts, to be attacked by white ants—were replaced by iron poles. Since then interruptions have been very infrequent, and now Australia has other means of telegraphic communication with the outside world.

Alice Springs station, with its group of buildings, nestles amongst the hills by the side of the Todd river, at a spot where a bar of rock stretches across the bed and gives rise to a water pool which is very rarely dry (Fig. 68). Even in times of drought, water can be obtained by sinking in the sandy bed of the river. During a good season it is a picturesque spot, with its rocky hills of red quartzite and intervening flats covered with herbage on which the station cattle browse with great advantage, so far as the quality of the meat is concerned. The station forms quite a little settlement in itself, with its operating room where day and night the machines are ticking ceaselessly ; separate quarters for the officer in charge ; dining, mess and living rooms for the operators, four in number ; rooms for the line men ; battery room, shoeing forge, blacksmith's shop and all other essentials of a little settlement that must be able to provide for many a sudden emergency which requires that the officers shall be much more than mere

telegraph operators. Night and day the messages go ticking through the office, and all the time at least one officer is on duty, for, if the line works badly, the messages must be repeated on, either north or south, as the case may be. When we were first there, on the Horn Expedition in July 1894, a six-weekly mail service ran between Alice Springs and Oodnadatta, following for the most part the track of the telegraph line. The journey was a tedious one, occupying ten days and even longer in bad seasons when the horses were in poor condition. Of course there were no such things as hotels, and you had to carry with you all you wanted to eat on the journey, except that at Crown Point on the Finke one was always sure of a kindly welcome at the hands of Mr. and Mrs. Alec. Ross, then in charge of the cattle station of that name, though now it is closed. At the present time the mail runs every two weeks, and Alice Springs, in consequence, is very much less isolated, though there still remains the ten days' journey—travelling all day long in the heat and glare and camping in the open, lying down, wrapped up in your rug, just wherever you happen to come to at night-time.[1]

[1] Even at the present day—though, since the breaking out of the Arltunga gold field in 1902 the country has become more opened-up and accessible—the track is not always an easy one. During the drought of 1907 the horse service, owing to the absence of surface water, had to be suspended, and the mails were carried through on camels. On the occasion of my first visit in 1894 I made my home at the telegraph station, and since the day when I was first welcomed there by Mr. and Mrs. Gillen, there is no part of Australia with which I have had more pleasant or more intensely interesting associations. I am only echoing the sentiments of all those, like myself, whose lot it was in these early days to traverse the centre of the continent, when I say that the presence of Mrs. Kell at Powell Creek in the far north, of Mrs. Gillen at Alice Springs, and of Mrs. Ross at Crown Point, for many years rendered these three remote and isolated spots veritable oases of rest in a desert of discomfort. —(W. B. S.)

CHAPTER VIII

THE ARUNTA NATIVES AND SOME OF THEIR CUSTOMS AND BELIEFS

The Arunta is probably the largest tribe in Central Australia, and occupies a tract of country extending from the Macumba River in the south to seventy miles north of the Macdonnell Ranges, a total distance of about four hundred miles ; how far the tribe extends east and west there is no means of knowing with anything like accuracy. The country which it now occupies is very varied in nature. The southern part is Steppe land, gradually rising from an elevation of only seventy-four feet at the Macumba River to two thousand feet in the north, where the Macdonnell Ranges run across from east to west, with, here and there, bold peaks and cliffs reaching the height of nearly five thousand feet. To the north again of the Macdonnell Ranges, the Burt Plains reach an elevation of three thousand feet. During the winter months the climate is, for the most part, delightful. The days are warm, bright and clear, with a strong, refreshing, south-east wind almost every day. The nights are cold, the thermometer often falling several degrees below freezing point, but the air is so dry that the cold is but very little felt, even when you wake up to find your water bags frozen solid. There is nothing more invigorating than camping out in the open under these conditions, and

at night the brilliant clearness of the stars is marvellous. It is a strange thing that, with nights so cold, the natives have never made any use of the fur of wallabies and kangaroos, which, except in time of drought, they can easily secure in many parts. In the coastal districts of the south-east of Australia they used to make very serviceable fur cloaks, but in the whole of the Central area they go stark naked and have no idea of clothing, until they come into contact with the white man, when they soon learn to appreciate the government blanket and any cast-off clothing which is given them by the settlers. This is not, however, at all an unmixed blessing to them, as they have a habit of passing on any clothing, of which they may become possessed, from one person to another, with the result that, sometimes wearing clothing and sometimes going naked, they become liable to attacks of phthisis. However kind the white man may be, no sooner does the savage come into contact with him than the change in life, both as regards food and clothing, quite apart from the introduction of disease, serves rapidly to bring about deterioration. He is right enough so long as he remains in the surroundings to which he and his ancestors have been accustomed, but he seems to have great difficulty in adapting himself to new conditions.

When the white man forms a settlement, however small, the natives gather round, attracted at first by curiosity and then by the chance of securing cast-off clothing, food, tobacco and knives. The young men under the new influences, and more especially those who may be employed at such work as cattle mustering, become freed from the wholesome restraint of the old men. In the natural state of the tribe they have always been told, and have implicitly believed, that severe punishment will magically and inevitably follow any disobedience of

Fig. 68. ALICE SPRINGS TELEGRAPH STATION (p. 183).
The tree on the right-hand side is a "native orange" (*Capparis mitchelli*).

Fig. 69. BABY ASLEEP IN A PITCHI.

rules laid down by their elders. They very quickly realise that this is not the case. The strict moral code, which is certainly enforced in their natural state, is very soon set aside and nothing is adopted in place of it. The old men see with sorrow that their influence over the younger men is gone, that they no longer take any interest in the time-honoured traditions of their ancestors, or in the ancient customs of the tribe, and naturally they decline to hand them on to successors who, according to their ideas, are not worthy to be trusted with them. In the course of comparatively few years, when the older men are dead and gone, all knowledge of the sacred matters of the tribe is lost.

The native is usually spoken of as a "blackfellow" but as a matter of fact he is not black at all. His real colour is a dark chocolate. The newly-born child is copper-red in colour,[1] but the skin rapidly darkens and in a few days it has assumed almost the normal tint.[2] So far as physical features are concerned, the natives of the Arunta tribe[3] may be taken as typical of those of Central Australia generally, though certain variations in the way in which the hair is treated produce a considerable amount of difference in the personal appearance of the men in different parts of the interior.

For some months after birth the young child is carried about in a wooden trough, which they call a pitchi, or on a simple slab of bark cut from a gum tree (Fig. 69). As soon as it can sit up it is carried, straddle-legged, across the left hip of its mother, who thus has her

[1] Corresponding very closely to tint No. 5 on Plate iii, *Notes and Queries on Anthropology*, London, 3rd edit., 1899.

[2] Corresponding to tint No. 3, *loc. cit.*

[3] An excellent account of the physical features of the Arunta tribe has been given by Dr. Stirling in the *Horn Expedition Report*, Pt. IV., 1896.

right hand free to carry and, if necessary, use a digging stick, or on its mother's shoulders (Fig. 70). The young Australian savage, granted a good season with its accompaniment of plenty of food and water, has by no means an unhappy childhood ; certainly it is a very healthy one. It is of course, like its mother, innocent of all clothing. At first it toddles about on all fours (Fig. 71) and is as much a centre of attraction as a white baby of the same age—in fact the Central Australian is just as fond of, and just as kind to, his children as the average civilised parent. It is a great mistake to suppose that the Australian child is "miserable, underfed, and hopeless of face." In her charming book *Little Folks of Many Lands* Mrs. Milne has given us an account of Australian children. We have often wished that Mrs. Milne could have seen the children in Central Australia, far away from the contaminating influence of the white man. Her accounts of the score upon score of babies who were slaughtered by their mothers every year; of babies having their brains dashed out, and of a wretched mother flinging a child, in desperation, from her back in order to be able to carry on a load of kangaroo flesh, or a heavy dilly bag, fearful that, if these were not kept safe, she would receive a terrible thrashing from her lord and master, who cared nothing for the baby, are, we feel sure, much exaggerated. In the early days the average white man in Australia, and more especially in Queensland, though there were fortunately many exceptions to this rule, formed a very low opinion of the savage, whom, in most cases, he took not the slightest trouble to understand. When the white man came upon the scene and occupied the country, stocking it with cattle, he very naturally shot the emu and kangaroo, upon which the natives fed. Naturally

Fig. 70. WOMAN CARRYING CHILD, ARUNTA TRIBE.

Fig. 71. YOUNG CHILD, ARUNTA TRIBE.

also the savage thought that, as the white man killed the kangaroo, he was lawfully entitled to kill the bullock. It was only a case of tit for tat, but, unfortunately, the white man had a rifle and the blackfellow only a spear and boomerang ; and as the savage could not write to the newspapers and put his case before the public, and as, of course, he could not possibly discriminate between one white man and another, any more than the white man could discriminate between one blackfellow and another, he simply regarded all white men as his enemies, and did his best, in his own way, to protect himself and to retaliate.

There is no doubt but that the blackfellow, when he had the chance of doing so, committed what the white man, from his point of view, regarded as an outrage ; but at the same time the outrages committed by the blacks were as nothing in comparison with those committed by the white men. In some cases it is quite possible that the harassed natives, driven before the white man from one camping ground to another, may, in desperation, have taken the lives of their children, rather than see them brutally murdered by white men or, worse still, by blood-thirsty and merciless black trackers. Though, it may be hoped, such things do not take place now, they once did, and there are parts of Australia where it is well to draw the veil over the past history of the relationship between the blackfellow and the white man.

In Central Australia, with (undoubtedly, but very rarely) exceptions here and there, the treatment of the natives has been uniformly kind, and fortunately for them, the only white men with whom for a long time they came into contact, to any great extent, were the officers of the overland telegraph line. We have travelled much in Central Australia and can say with confidence

that, though of course there are and have been isolated cases of harsh treatment at the hands of irresponsible individuals, the natives live on the most friendly terms with, and are most kindly treated, both by the officers of the telegraph line, the few patrol officers of the mounted police, where such are stationed, and the holders of the few scattered cattle-runs.[1]

However, to return to the children. The little black piccaninny enjoys itself just as much as the average white child. On the march, when too young to walk, it is carried by its mother or father, the latter being as fond of, and kind to, the child as the mother is. In camp you can hear the children hour after hour, laughing and shouting at their play (Fig. 72). Out in the scrub with their tiny digging sticks they mimic the action of their mothers, and at an age when the white child is learning to read books, they are busy, all unconscious to themselves, learning to read the book of nature. They gradually come to know where to find bulbs and seeds that are good to eat, and to recognise the tracks of every animal, large and small, that burrows in the ground or nests in the trees. Up to the age of perhaps twelve or thirteen, boys and girls alike live in the women's camp and accompany them in their daily rambles through the scrub in search of food. Of course, the moment you come near them with a camera

[1] During recent years, since the time to which the above refers, conditions have changed to a large extent. The "breaking-out" of the Altunga gold field, in 1902, led to the influx of considerable numbers of white men into the Central area. It is estimated that, at one time, there were no fewer than between three and four thousand men on the field, all of whom had, of necessity, travelled along the track of the telegraph line. At the time when we knew the Macdonnell Range country, the total number of its white inhabitants was not more than twenty or thirty, scattered over a very wide area. The influx, since then, of so many gold miners, though almost all of them have now left the country, resulted, as it always does, in far-reaching changes amongst the natives.

Fig. 72. GROUP OF BOYS, ARUNTA TRIBE.

Fig. 73. ARUNTA NATIVE, TO SHOW THE WAVY NATURE OF THE HAIR.

Fig. 75.—ARUNTA NATIVE, FULL FACE.

they become as sedate and demure as possible, and we could never manage to secure a really good photograph of a child—that is, one which shows it at play—but, in ordinary circumstances, they are by no means "hopeless of face." We used sometimes to have a score or more of piccaninnies gathered round us when distributing sweets, and there was never the slightest attempt made by any child to secure more than its own share. The bigger ones always took good care that the little ones were not overlooked.

After the age of about twelve the boys are taken in charge by the men, and henceforth they begin to take part in the men's occupations and accompany them in their hunting expeditions. Not until he has passed, probably at the age of fourteen or fifteen, through the ceremonies of initiation is a youth allowed to carry a spear and shield, though, as a boy, he has plenty of experience with mimic weapons. It is a proud moment in his life when, for the first time, he is presented with a boomerang and allowed to own and use the weapons of a man.

The Arunta man is by no means poor in physique; in fact he might often serve a sculptor for a model, and, when walking behind a native, you are continually struck with his proportions and beautiful carriage. Every muscle in the body seems to be well developed, and though, as is usual amongst savages, the legs are apt to be somewhat spindle-shaped, yet they are not always so, and every now and then, especially when the face is not seen, you could easily fancy that you were looking at a bronze statue. In the true Central tribes every man has a well-developed beard and a thick mass of wavy locks on his head (Fig. 74). A bald native is practically unknown, but it must be confessed that their habit of continually

rubbing grease and red ochre on their hair, though doubtless efficacious in assisting the growth, is not altogether a pleasant one. In a state of nature, it appears as if the human hair continues to grow throughout life, much as it does in the lower animals. It is only amongst the very old men whose hair is turning grey (and this only takes place in extreme old age) that it becomes even thin. Amongst the many hundreds of natives whom we have seen, we have not seen one who was really bald. In some parts the men bunch the hair up on the back of the head and place on top of it a pad of emu feathers, fixed on with bone pins and fur string, forming altogether a kind of chignon which is often surmounted by a plume of eagle-hawk or emu feathers. At first sight every grown Arunta man appears to have an extensive forehead, which is due to the curious habit of pulling out all the hairs for some distance back. The hairs must be pulled out and not cut off, and it is very customary for them to wear a broad forehead band made of closely-woven fur string, daubed over with white pipeclay, or ornamented with geometrical designs, drawn in red or yellow ochre. The hair, if allowed to grow, falls down over the shoulders in wavy ringlets, but as a general rule it is kept fairly short, because, amongst these tribes, human hair is a most valuable commodity, and it is the duty of every man and woman periodically to provide others, who stand in a certain relationship to them, with a supply of their own hair. By means of a very simple kind of spindle it is woven into string, and this is used for sundry purposes such as the making of waist girdles—almost the only article of clothing, if such it may be called, which is worn by the men. In all cases, the hair is wavy and never woolly, and in colour it is characteristically black, though every now and then you meet with isolated individuals,

Fig. 76. ARUNTA NATIVE, SIDE FACE.

Fig. 77. ARUNTA NATIVE, OLD MAN.

most usually girls and young children, in whom it is even flaxen-coloured ; but this lighter colour is usually confined to the tips, and in time it generally, but not always, assumes the normal tint. The hair of the men, especially, has often a slightly reddish-brown tinge, but this is due to the fact that they are so fond of red ochre and lose no chance of rubbing it over their body. The hair of the beard is always jet black and frizzy, and in the Arunta man it is well developed.

So far as height is concerned, the average of forty men belonging to various tribes in Central Australia is 169·4 cm. or, in English measure, five feet seven inches. These forty include, however, one or two exceptionally tall men of the Warramunga tribe, the tallest reaching the height of 182 cm., or nearly five feet eleven inches. The smallest is 158·2 cm., or very slightly over five feet. A fair average height for the men may be given as, approximately, five feet six inches.

The illustrations will serve to give a good idea of the general personal appearance of the men and boys (Figs. 73, 75, 76, 77). They are commonly spoken of as "the blacks," but it must be remembered that this is only a popular term, and that really their skin is chocolate-coloured. Amongst the best known and most striking characteristics of the native features are the depression of the root of the nose and the great development of the ridges above the eyes, which cause the latter to appear to recede into the head and often throw them into deep shade. The depression of the root of the nose, aided sometimes by a slight elevation of the bridge, though most often this is wanting, gives it a superficial resemblance to the Semitic type ; in fact this has not seldom been referred to by casual observers, but on closer study, the characteristic hook-shape of the Semitic nose is

always found to be wanting, and, in front view, its great width at once dispels the illusion—a width that is accentuated, during the lifetime of the individual, by the constant wearing of a nose bone or stick.

The full beard of an Arunta native hides from view an equally typical feature, which is the great size and forward growth of the jaws.

It has been suggested, by Professor Gregory,[1] that the depth of the notch above the nose and the recession of the eyes may be a secondary variation "due to the shrinking backward of the eye to escape the glare of the sandy plains." The same writer adds that he has "been assured by one or two acute observers that it is possible to recognise men who have been born and have grown up in the Australian plains, by their receding eyes. And if such a change is possible in one generation, natural selection, acting through many generations, may have developed the low bridge and receding eyes of the aborigines."

So far as white men are concerned, it may be safely said that, though an acute observer would probably be able to pick out, with fair accuracy, from amongst a number of Australians, those who had lived for long exposed to the glare of our inland plains, he would only be able to do so by aid of various characteristics and would fail hopelessly if he relied solely upon, or indeed paid much attention to, the presence of receding eyes.

The receding forehead, strongly developed supra-orbital ridges, depressed root of nose and prognathous jaws are fundamental characters common to all Australian aborigines, and have nothing whatever to do with whether they live on the inland plains, where day after day the sun shines fiercely down upon them, or whether they wander about amongst the more pleasant surroundings of the hills

[1] *The Dead Heart of a Continent*, p. 178.

Fig. 78. YOUNG WOMEN, ARUNTA TRIBE, SIDE FACE.

Fig. 79. YOUNG WOMEN, ARUNTA TRIBE, FULL FACE.

and forest lands that fringe the shore line of the continent.

Small as is the opportunity of gratifying the feeling of vanity, it is undoubtedly present amongst these savages. By way of ornament, a would-be dandy wears a long nose bone through the hole in the nasal septum, with a little tuft of bright coloured feathers fixed in one end. His forehead is covered with a white band, and on his head a tuft of owl or cockatoo feathers stands out in strong contrast to his black locks. Around the upper part of each arm he twines perhaps as many as twenty little fur string bands, and these serve for the insertion of little tufts of feathers, a final coating of red ochre completing his toilet.

The women vary very much in personal appearance at different times of their life, much more so than the men do, simply because they have no beard with which to conceal the outline of their jaws (Figs. 78, 79, 80, 81). In the Arunta tribe the tint of the body is just a shade lighter than that of the men, but further north no difference is noticeable. Under normal conditions they are, except for the use of a small apron, quite naked. This is very convenient during the hot season, when they merely build a little lean-to of boughs to shelter them from the heat, but during the bitterly cold nights of winter they must be extremely uncomfortable. A married woman is allowed to wear neck rings and head rings ; in fact they have a very large number of the latter, made out of tightly-woven fur string, thickly coated with grease and red ochre. Their hair is black, just like that of the men, and would, if allowed to grow any length, doubtless form long wavy locks ; but a woman with anything like long hair is never seen. As soon as ever it grows more than a few inches in length she cuts it

off and carefully preserves it, as it must be made into string to provide a waist girdle for some son-in-law. Like all savages, the woman grows old at a very early age, and this quite apart, apparently, from any special hardship or ill treatment. By the time she is twenty-five, or, at most, thirty, she is completely *passée*, and at forty is a veritable hag. To what age she attains it is difficult to say, but there are probably few who live beyond the age of fifty. The younger women walk with remarkable grace, due partly to the fact that they are not impeded by a close-fitting dress, and partly also to the fact that they are accustomed to carry a wooden bowl containing food and water on their heads, using perhaps one hand to balance it with, though as often as not they will have both hands full and walk along freely without touching the bowl. One day, at Alice Springs, we saw a native woman walking along quite comfortably, with a big bowl of grass seed balanced on her head, her left arm was around a child, sitting straddled-legged across her hip, and under her right she held a second bowl of seed. Wondering what she would do, we threw her half a stick of tobacco. It fell on the ground, and without a moment's hesitation she picked it up with her right foot, using her great toe as we should do our thumb, transferred it to her right hand, and went on with a smile. After you have become accustomed to the graceful carriage of a savage woman, the walk of the ordinary white woman seems, by comparison, like an awkward waddle. However, they soon lose their figure and seem to shrink up until their skin hangs in wrinkles on their prominent bones. Both in men and women the hands and feet are decidedly small. The space hollowed out in the solid shield to admit the hand to grasp the bar which serves as a handle is so small that the ordinary white man cannot use it. Another

Fig. 80. YOUNG WOMAN, ARUNTA, SHOWING BODY SCARS AND TOOTH KNOCKED OUT.

striking feature of the savage is the noticeable way in which, when walking, he turns his toes outwards. This is seen even in the case of children.

The women vary even more in height than the men do, and the average amongst the Arunta tribe is, approximately, five feet two inches. Their voice is decidedly soft and musical, except when they get excited, as during a fight, when their shrill shrieking can be heard far away.

The aborigine is a true nomad, wandering from place to place over the country which belongs to the tribe, or to the local group of which he is a member, camping perhaps for weeks together at some favourite spot where he can easily get enough to eat and drink. It must be remembered that he has not reached the agricultural stage of civilisation and has no idea of cultivating cereals or of laying in a stock of food to maintain himself during the time when food is scarce. He lives from hand to mouth without any thought of the morrow. When food is abundant he eats in plenty and is quite happy ; when it is scarce he accepts the conditions philosophically and, if hungry, merely tightens his waist belt and patiently waits till such time as he can find something to eat. There are of course times when he is hard pressed, and during a long continuance of drought his life is not a happy one ; in fact he is absolutely at the mercy of his surroundings. Fortunately his very lack of power to control nature, though he is firmly convinced that he can do so, has been the means of sharpening his powers of observation, and he can obtain water and food in comparative abundance in places where a civilised man would die of thirst and starvation. There are, however, times when even the aborigine with all his bush-craft, and this is simply marvellous, is unable to contend against the fierce heat and drought of the Centre, and perishes miserably.

Every tribe has its own country and its boundaries are well known.

Within the limits of the tribe there are also local groups who occupy and are supposed to own certain districts. Every member of the tribe may wander with impunity over the whole tribal area, provided he complies with certain well-established rules of etiquette, but he spends the greater part of his time within the district occupied by his own local group. There never appears to be any attempt made to annex new country or to encroach in any way upon other tribes or groups. This is a result of the very firmly-fixed belief of the natives that they are the direct descendants or reincarnations of ancient ancestors, who were especially associated with certain local spots at which their spirit parts remained when they died and their bodies went into the earth. If we take any one such local group we find that it consists of men, women and children numbering not more, as a general rule, than one hundred and often less than a score, and occupying a tract of land which may extend over a hundred square miles or may be very much smaller, perhaps only a few square miles. As a general rule all the local groups within the limits of the tribe are quite friendly, though, at times, quarrels will arise between different groups and a fight will ensue. The fighting of the natives is not, usually, a very serious matter, at all events within the limits of the tribe, and in Central Australia the country is such that it can only be sparsely populated and it is not possible for any really large mob of natives to gather together and provide themselves with food while on the march. In the more fertile parts of south-eastern Australia, where there was never any lack of water and where animals were abundant, the members of a tribe could gather together in considerable numbers and, under cover of the forests which clothed the

Fig. 81. OLD WOMAN, ARUNTA TRIBE.

hill sides and the plains, could move about in large numbers and stealthily attack their enemies. In Central Australia there is nothing but open scrub-covered country and bare mountain ranges. Not only so, but, except during the short rain season, waterholes are few and far between and the supply of food and water renders it absolutely impossible for any large body of men to move about together. Even if they attempted to do so, they would have to march in the open, which is not at all an Australian aboriginal idea of war. The result is that inter-tribal fights, except on a very small scale, do not take place. At most a small body, organised for the purpose of killing some special individual who is supposed to have done harm by magic, will go out from one tribe and stealthily invade the country of another. It will take very good care to avoid coming into contact with a party of the enemy larger than itself, and will quietly await an opportunity when the culprit is out in the bush or in company with only one or two others, and then, when there is no danger, he will be speared from behind.

Every now and again quarrels arise between individual members of different local groups ; for a time relations will be strained and will remain so until there is a fight, in which the two men will be supported by members of their respective groups. The fight is not usually a very serious matter. Probably a few boomerangs and a spear or two will be thrown, or perhaps the two men will cut one another with stone knives to the accompaniment of an immense amount of yelling and gesticulation. When it is over, all ill-feeling is usually put on one side ; indeed one of the most striking features of the native character is the way in which, after a fight, the erstwhile hostile groups or individuals come together and appear to be on the best of terms. You will sometimes hear two men using the most

atrocious language to each other, fighting hard, and then, when once the fight is over and honour has been satisfied, they fraternise in the most friendly way possible. As a general rule, however, the various groups within the limits of the tribe are quite friendly ; and, where they come into contact with one another, on the boundary line of their respective territories, adjacent tribes are just the same. Amongst the very many native camps which we visited, and with the members of which we became intimate, we almost always found one or more, and often a considerable number of visitors from other tribes. In Arunta camps we met Kaitish men, in Kaitish camps Arunta, in the Warramunga camps were Kaitish, Worgaia, Wulmalla and Walpari men, and so on, right through the continent. It is quite true that you hear reports of the fierce and bloodthirsty nature of distant tribes. A Kaitish man, for example, will tell you that he much dreads the Bingongina tribe, which lives away to the north-west of the Kaitish country ; but it is really only a matter of hearsay, and but another illustration of the old adage, *omne ignotum pro magnifico*. The Kaitish man will be living in friendly relations with his Arunta neighbours in the south and the Warramunga on the north, and the latter in just the same way will be quite friendly with the dreaded Bingongina. It is simply a case of fear of anything distant and unknown. In Central Australia there is no such thing as constant inter-tribal hostility, and the savage has a marvellous capacity for exaggerating the reports of such fights as do really take place.

While we were at Charlotte Waters the natives performed an especially interesting rain ceremony, as it was a time when rain might fall. As can be easily imagined, the water supply is a very important matter to the native. Without water there are no animals and no plants for him

to feed upon, and in all of the tribes there are special groups of individuals who are known as rain-men, upon whom devolves the duty of seeing that the supply is maintained. There are often many months during which no rain falls ; in fact, in times of severe drought, a year or even longer may elapse without any fall.

In order, however, fully to appreciate and understand the native ceremonies it is necessary to give some short explanation of their curious social organisation and a little account of one or two of their important beliefs. When a white man goes amongst Australian savages one of the first things which strikes, and also puzzles him, is the intricate nature of their social system. It is absolutely distinct from anything to which he has been accustomed. There are no individual terms such as father, mother wife, husband, but there are names, and these in plenty, which are applied to groups of individuals. In the first place the whole tribe, just as in the case of the Urabunna, is divided into two halves, each of which we shall speak of as a moiety. In the Arunta their actual names are lost, but the fact that the tribe is so divided is made abundantly clear by evidence of various kinds.

Each moiety is again divided into two classes ; one, which we will call Moiety A, has the classes Panunga and Bulthara ; the other, which we will call Moiety B, has the classes Purula and Kumara. Every individual member of the tribe belongs to one or other of these classes—exactly which is determined by his father's class. If we arrange them in a simple table the matter becomes clearer. Thus :—

The horizontal lines indicate the marriages and the slanting lines, leading from the woman's class, the classes into which the children fall. For example, a Panunga man marries a Purula woman and their children are Bulthara. A Kumara man marries a Bulthara woman and their children are Purula. Amongst Australian savages no man is free to marry just whom he likes. In the first place a man of Moiety A can only marry a woman of Moiety B and *vice versâ*, and, further still, a Panunga man can only marry a Purula woman and *vice versâ;* a Bulthara man can only marry a Kumara woman and *vice versâ*. Still more strange, the children of Panunga man and Purula woman are neither Panunga nor Purula, but Bulthara. That is, a man's children pass into the moiety of the tribe to which he belongs, but into the class to which he does not belong. If a Panunga man, say, wants to marry a Bulthara woman he knows perfectly well that it means certain death to both of them ; in fact so strictly are the marriage rules adhered to in the normal state of the tribe that such an idea probably never enters the head of a native.[1] For a Panunga man to have a Kumara woman as wife is not so heinous an offence, but here again it would mean that anyone would be perfectly justified in killing either of them. They would at least be forcibly separated and severely punished, and neither of them would be admitted to the camp or allowed to take any part in the various ceremonies. They would, in fact, be practically excommunicated. Years ago, in the group of the Arunta living near Charlotte Waters, one strong fighter did actually take as wife a woman of the wrong class—he was

[1] We are, of course, referring to the customs of the uncontaminated natives. Contact with white men results sooner or later in the breaking down of the marriage rules.

Panunga and she was Kumara, whereas his proper wife was a Purula. Of course they had to elope secretly and dare not return to camp. Parties were sent out to kill them, but, by his strength and watchfulness, the man managed to outwit his enemies ; indeed he actually killed two of them and then the others thought it best to leave him alone, but ever after he lived the life of a pariah out in the wilds.[1] Public opinion is very strong amongst savages, and it is dangerous to run counter to it.

As a matter of fact things are a good deal more complicated than we have described above ; all the Panunga men are divided into two sets which we will call *a* and *b*, and in the same way all the Purula women are divided into two sets which we will also call *a* and *b*. Panunga *a* can only marry Purula *a*, and Panunga *b* can only marry Purula *b*. Every Panunga *a* man calls every Purula *a* woman by the name Unawa and *vice versâ*. Any Panunga *a* man may legally marry every Purula *a* woman in the whole tribe, but he must not marry anyone else, unless he be desirous of courting trouble both for himself and for her. Now it will be seen from the table that the father of a Purula woman must be a Kumara man. So that if I am a Panunga man, then there are half of the Kumara men who might legally be my fathers-in-law and I call every one of them by the same name, viz. Ikuntera, and draw no distinction between my actual and my potential fathers-in-law. So again I can and do have hundreds of mothers-in-law, actual and potential, and call them all by the one name, Mura. Right through the whole series of relationship-terms, and these may

[1] At the present time marriage between a Panunga man and a Kumara woman would be tolerated, but this is simply due to the fact that the serious lessening in number of the members of the tribe makes it impracticable to carry out the old marriage laws in their entirety.

mount up to nearly forty in some tribes, covering five generations in the most perplexing and bewildering way, everything refers to the group and not to the individual. It is only at a later stage of civilisation that the individual looms larger than the group. An Arunta man draws no distinction between any of his Ikunteras. They form a group of men, to each and every one of whom he has certain duties to perform. That one or two particular ones amongst them are what we should call fathers-in-law makes no difference whatever in his treatment of these special men. It is his duty to give a certain portion of any food he may secure to any Ikuntera who may chance to be in camp, and if any Ikuntera dies he must cut himself, in token of mourning, whether the particular Ikuntera man happens to be his greatest enemy or his dearest friend. If he does not do his duty to each and every member of the group, then any one of them may take away his Unawa woman and bestow her upon some son-in-law who is more mindful of his duty. So again he has hundreds of Mura women and not one of them may speak to him ; in fact he must avoid them and they must avoid him as much as possible. Whether any particular woman be his actual mother-in-law, or only one who might legally have been so, makes not the slightest difference.[1]

The Arunta savage cannot possibly understand how it is that a white man applies the same term of relationship—nephew or niece—to his brothers' and to his sisters' children. Let us refer again to the table showing the marriage relationships. If the reader can imagine himself

[1] This mutual avoidance of mother-in-law and son-in-law is universal in Australian tribes. It applies equally strongly not only to a man's actual mother-in-law, but to any one of the numerous women whose daughters, whether they have any or not, he might legally marry.

to be, say, a Panunga blackfellow, then he must marry a Purula woman. His brother is likewise a Panunga and must also marry a Purula woman. Both his and his brother's children are Bulthara, and therefore they all belong to the same group and he calls them indiscriminately by the term Allira ; and, as the fathers of all the children belong to the same group amongst the Panunga, the children call them all indiscriminately by the term Oknia. On the other hand if the reader again imagines himself to be a Panunga, then of course his sister will be the same. She has to marry a Purula man, and her children are Kumara. That is, if we take a brother and sister, both called Panunga, the children of the former are Bulthara and those of the latter are Kumara ; that is, they belong to two different sides of the tribe. To a blackfellow the idea of applying the same term of relationship, nephew or niece, to them, as we white men do, seems to be the height of stupidity, and from his point of view he is logically right.

The terms of relationship of the savage are most perplexing to the white man, and we must not here pursue the subject further. The marvel is how he remembers them.

In addition to the complicated class-system, the native has certain beliefs with regard to his ancestors which it is essential to understand, as a large part of the life of the older men is occupied in performing ceremonies associated with these ancestors. Most of the traditions of the Arunta refer to a far-back time called the Alcheringa, during which their remote and mythical ancestors lived, roaming over the country which their descendants now occupy. Everything that is sacred amongst the Arunta tribe is associated with the Alcheringa, or dream times, and all knowledge of such matters is kept

carefully hidden from the women and children. At first, in those far-off times, there were no actual men and women but only incomplete creatures. Curiously enough, the Arunta has worked out for himself a crude kind of theory of evolution. He believes that, in the early Alcheringa days, the whole country was covered with Kwatcha alia, or salt water, which was gradually drawn away to the far north by the people there who always wanted to get it and keep it for themselves. It is a curious coincidence that this tradition reflects, in general outline, what geological evidence indicates to have been the case, so far as a great inland sea is concerned. In those days there were groups of Inapertwa creatures, or incomplete human beings, who dwelt by the shores of the salt water. They had no distinct limbs and ate no food, but looked just like human beings all doubled up into a rounded mass, in which only the outlines of the different parts of the body could be seen. Some of these groups were supposed to be in course of transformation out of lizards, others out of rats, others out of parakeets, others out of Hakea trees, and so on. Far away in the Alkira aldorla, that is the western sky, there lived two beings of whom it is said that they were Ungambikula, which means made out of nothing or self-existing. Coming down to earth, armed with great stone knives, they took hold of the Inapertwa one after the other. A few cuts released the arms and legs; fingers and toes were added by making four cuts at the end of each limb; the nostrils were bored by the fingers. A slit on each side separated the eyelids and a cut with the knife made the mouth, which was pulled open several times to make it flexible. Thus out of animals and plants arose the original groups of human beings, who naturally, when they were formed, were intimately associated with the same animals and

Fig. 82. THE NANJA ROCK OF KUKAITCHA.

Fig. 83. ROCKS AT THE EMILY GAP, IN WHICH IS THE ERTNATULUNGA OF THE WITCHETTY GRUB TOTEM GROUP (p. 209).

plants. Some such tradition as this, varying locally in detail, is widely spread over a very large area in Central Australia. The material object with which the human ancestor was thus closely associated, out of which in fact he was supposed to have been evolved, is spoken of as that individual's totem, and thus we see the earliest origin of totemic groups amongst these tribes, or rather the savage's idea with regard to their origin. When once they had come into existence, these ancestral people started to wander across the country—lizard people along one track, kangaroo people along another, frog people along another, and so on right through the various totemic groups. Every one of these old ancestors carried with him, or her, a sacred stone or wooden slab, called a Churinga, with which the spirit part of the owner was supposed to be intimately associated. As they wandered over the Arunta country they made all the natural features—creeks, clay-pans, waterholes, hills and gorges—which are now familiar to the natives. At certain places they halted to perform ceremonies, and there different members of the party died—or, as the natives say, went down into the ground ; that is, their bodies did but their spirit parts remained above, in company with the Churinga, and stayed behind when the party moved on, dwelling afterwards in some tree or rock which was henceforth sacred to them and was called their Nanja (Fig. 82). The whole Arunta country is dotted over with such spots, which may be compared to stations on an intricate network of railway tracks.[1] The old men know exactly the lines of travel of their ancestors and exactly

[1] In *Native Tribes of Central Australia* we have indicated by means of maps the lines of travel which tradition says that certain of these ancestral groups followed during their wanderings over the Arunta country. These traditions are extraordinarily full of the most minute detail.

what spirits inhabit different spots—kangaroos in one, wild cats in another, rats, snakes, fishes in others and so on. When a child is born, it is simply one of these old ancestors who has undergone reincarnation, and thus every individual in the tribe gets his, or her, totem name, and belongs to the same totemic group as did its ancestor. We have already seen that, in the Urabunna tribe, the child takes the totem name of its mother, though, curiously enough, it is supposed to change its totem at each successive reincarnation. In the Arunta it follows that in one family the children may belong to various totem groups, as will be seen from the two following examples of families which, when we were working amongst the Arunta, lived in the Macdonnell Ranges: Family I, husband Little Hawk; wife 1, Rat, daughter Witchetty grub; wife 2, Kangaroo; wife 3, Lizard; daughters Emu and Water. Family II, husband Eagle-hawk; wife 1, Hakea tree; wife 2, Hakea tree; sons, Witchetty grub, Emu, Eagle-hawk, Elonka; two daughters, each Witchetty grub.

Granted the premises of the aborigine, the conclusions at which the Arunta man arrives are logical enough. In fact his system, which involves no such idea as that of change of sex and totem at each reincarnation, is, in some respects, more simple and straightforward than that of the Urabunna people.

At the present day much mystery surrounds the Churinga (Figs. 84, 85). No woman, child or uninitiated boy is allowed to handle or even see the sacred object. In itself it is simple enough and consists only of a slab of stone or wood, varying in length from an inch to even five or six feet, though it is only very rarely that Churinga of this size are met with. At the present day the Churinga of each local group are stored in some secret place, such

Fig. 84. WOODEN CHURINGA OR SACRED STICKS OF THE URABUNNA, LURITJA AND ARUNTA TRIBES.

1, Chimbaliri of the Urabunna tribe ; 2, Churinga of bell-bird totem, Luritja tribe ; 3, Churinga of frog totem, Arunta tribe ; 4, Churinga of lizard totem, Arunta tribe ; 5, Churinga of emu totem, Arunta tribe ; 6, Very old Churinga of lizard totem, Arunta tribe ; 7, Churinga wrapped in bark as it is when carried about.

as a cleft in the rocks which bound the sides of a deep gorge amongst the hills, the exact locality of which is known only to the old men and is called the Ertnatulunga (Fig. 83).

The Ertnatulunga may be looked upon as the early rudiment of a city or house of refuge. Everything in its immediate neighbourhood is sacred and must not be touched or hurt. A man who was being pursued by others would not be touched so long as he remained at this spot. If a native is chasing a wallaby or a kangaroo it is perfectly safe so long as it is quite close to one of these Ertnatulunga. No strange native would venture to rob one, even if he knew where it was, partly because he would be in mortal fear of the anger of the spirits associated with the Churinga and partly because if he ventured to touch them his life would not be worth a moment's purchase. On one or two occasions Ertnatulungas have been shown to white men by degenerate natives, but on each occasion the latter have been killed. On one occasion the Churinga were removed by a white man who did not understand their significance, and for two weeks the natives remained in camp weeping and mourning and plastering themselves over with pipe-clay, the emblem of mourning for the dead.

The illustrations will serve to give some idea of the general nature of the Churinga. The stone ones are always flat on each side, the wooden ones may be of the same form or, more usually, have one side flat and the other slightly convex, or they may often be concavo-convex in section. A certain number of the smaller ones—usually less than a foot in length—have a hole pierced through one end to which is attached a string made of human or opossum fur by means of which they can be twirled round.

Each of them is ornamented with a design that has a very definite meaning, though, in order to decipher any individual one, it is essential to gain the information from a man of the totem to which it belongs. Other natives may volunteer information, but as the same device will mean one thing to a native of one totem and quite another thing to a man who belongs to another totem, and as a man's knowledge is strictly confined to the designs of his own totem, it is quite unsafe to ask, say, an emu man to describe to you the markings on a wild cat Churinga, or *vice versâ*.

The following will serve to give some idea of the nature and meanings of the designs.

Figure A represents the Churinga nanja of a dead man of the frog totem. On either side of the Churinga, which is a wooden one 39 cm. in length, are three large series of concentric circles (*a*), which represent three large and celebrated gum trees which grow by the side of the Hugh River at Imanda, the centre of the particular group of the frog totem to which the owner of the totem belonged; the straight lines (*b*) passing out from them on one side of the Churinga represent their large roots, and the two series of curved lines at one end (*c*) their smaller roots. These trees are intimately associated with the frog totem, as out of them frogs are supposed to come, which is doubtless an allusion to the fact that in the cavities of old gum trees one species of frog is often found, and can be always heard croaking before the advent of rain. The smaller series of concentric circles on the same side of the Churinga (*d*) represent smaller gum trees, the lines attached to them being their roots, and the dotted lines (*e*) along the edge are the tracks of the frogs as they hop about in the sand of the river bed. On the opposite side of the Churinga the large series of double concentric

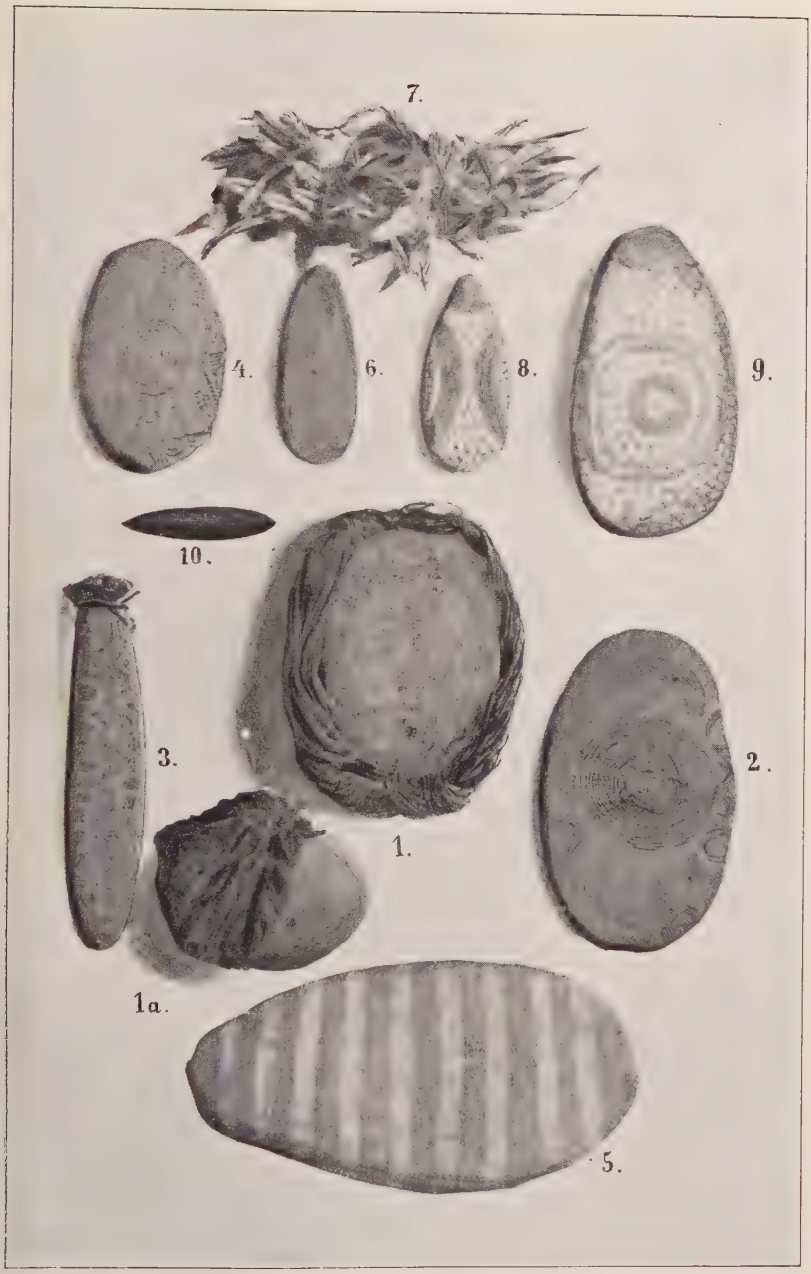


Fig. 85. STONE CHURINGA OF THE ARUNTA, KAITISH AND WARRAMUNGA TRIBES.

1, 1a, Churinga enclosed in human hair string and carried about together, Arunta tribe ; *2*, Churinga of euro totem, Arunta tribe ; 3, Churinga of water totem, Arunta tribe ; *4*, Churinga of witchetty grub totem, Arunta tribe ; 5, Churinga of Hakea tree totem, Arunta tribe ; 6, 7, Churinga and feather covering of the Warramunga tribe ; 8, 9, Churinga of the Kaitish tribe.

circles represent small frogs which have come out of the trees, and the lines connecting them are their limbs. This

Fig. A.

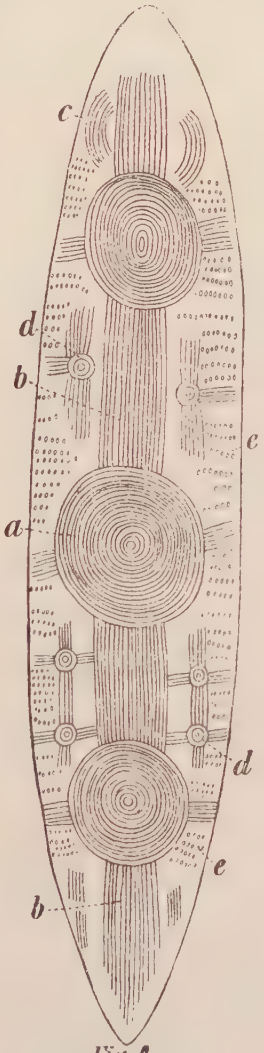


Fig. A.

device of small concentric circles united by lines is a very common one on frog Churinga.

Figure B represents the Churinga nanja of the celebrated Ilatirpa, a great leader of the Yarumpa or honey-ant totem, and is in the storehouse at Ilyaba. The series of circles (*a*) with a hole bored in the middle of them represent the eye. The circles (*b*) represent the intestines, (*c*) the painting on the stomach, and (*d*) the posterior part of the man. On the reverse side the circles (*g*) represent the intestines of the Alatirpa, a little bird which is regarded as the mate of the Yarrumpa.

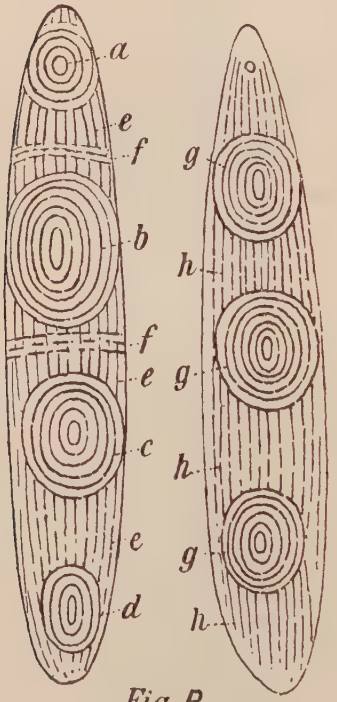


Fig. B.

Figure C represents the Churinga of an Achilpa or wild cat man. The three series of circles (*a*) represent Unjiamba or Hakea trees, while the circles of spots (*b*) represent the tracks of the men dancing round them. The lines (*d*) represent the Wanpa sticks, which are beaten together to keep time to the dancing; and the dots (*e*) represent again the tracks of dancing men. This Churinga is in the store house at Imanda, and was used during the Engwura ceremony.

Figure D represents the Churinga of an Udnirringita or witchetty grub man, and is in the Emily Gap storehouse. The curved lines (*a*) represent a large grub, (*b*) represents a lot of grubs in a hole which is scooped out in the ground, and (*c*) represents a man sitting down and

squeezing the dirt out of the animals preparatory to cooking them. On the reverse side, (*d*) represents a grub, (*e*) the eggs of various sizes, and (*f*) marks on the body of the grub.

Fig.C.

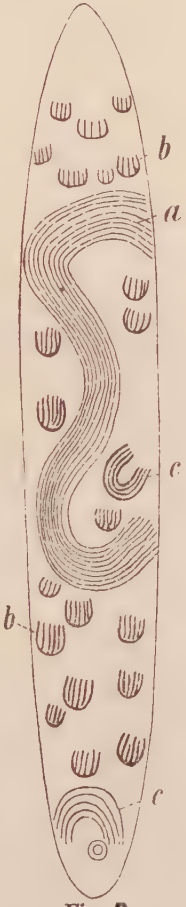


Fig.D

Fig.D.

Figure E represents one side of the Churinga nanja of the elder of the two women who accompanied the men of the Ukakia or plum-tree totem (*Santalum sp.*) in the Alcheringa, and were taken away to the north by a

celebrated individual called Kukaitcha. The three series of concentric circles (*a*) represent frogs, the two outer rows of dots represent the tracks of the women. The lines across the Churinga (*b*) represent bark of gum trees, and the curved lines at one end (*c*) represent an old woman collecting frogs.

Fig. E.

Fig. E.

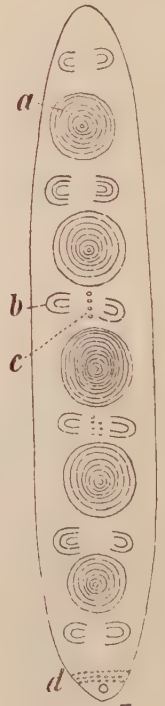


Fig. F.

Figure F represents one side of the Churinga nanja of the younger of the same two women. Here again the concentric circles (*a*) represent frogs, the semi-circles (*b*) represent women sitting down opposite to each other, while the dots between them (*c*) are the holes which they make in scratching the frogs out of the sand.

Figure G represents the Churinga nanja of an Echunpa

or lizard man (the large lizard, *Varanus giganteus*), and is remarkable as being one of the only five Churinga of this shape which we have seen amongst a very great number. On one side the greater part is occupied by four roughly parallel, sinuous lines which represent the long tail of the animal; the semi-circular lines are the indications of ribs and the dotted lines at one end are the tracks of the animal. On the other side, (*a*) represents the shoulder of the animal; (*b*) the spotted black marks across the chest; (*c*) the large ribs—those, as the natives say, with much fat on them; (*d*) the smaller ribs, and (*e*) the spotted marks along the under surface of the animal. This Churinga was evidently a very old one; it was slightly broken at one end, and by constantly repeated rubbing the design was indistinct in parts.

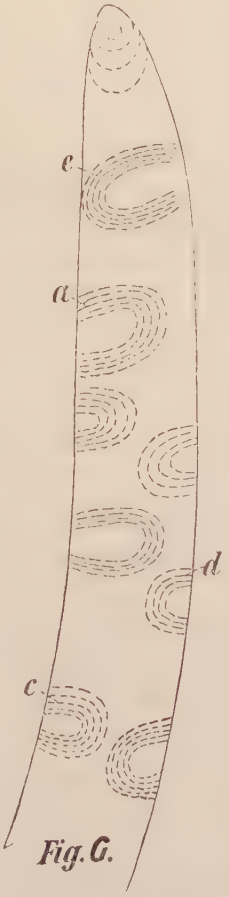


Fig. G.

Fig. G.

The workmanship of the Churinga varies to a considerable extent in its quality; on some the lines are clearly cut, and, considering the hardness of the material and the

crudity of the tool used, the result is surprisingly good so far as the regularity of the design is concerned ; but in all cases the design is a purely conventional one, and never attempts to indicate in form the specific object which it is supposed to represent, or rather to indicate. The most important feature is almost always indicated by a series of concentric circles or by spiral lines, while tracks of men and animals seem to be represented by dots arranged in circular or straight lines. Individual men and women appear to be uniformly represented by semi-circular lines, and may be said, speaking generally, to be regarded as subordinate to the animal or plant indicated in the design by complete circles or spirals.

The Churinga in the Ertnatulunga are those which are supposed to have belonged to the old ancestors, who went into the earth at that special place, and they are most carefully watched over, and, every now and then, examined and rubbed with grease and red ochre. Where these Churinga came from originally, who they were made by, and when and by whom they were gathered together, are questions which cannot be answered. Many of them are evidently of great antiquity. The designs which they once had carved upon them are, in some cases, completely obliterated by rubbing, and, as this is done by the hand only, some idea may be formed of the length of time during which these Churinga have been in the possession of the natives. Similar sacred objects are met with all over Australia, and are known popularly as bull-roarers, on account of the curious noise which they make when twirled round and round at the end of a string. They are also found amongst savages in other parts of the world, as in South and West Africa and amongst certain of the North American tribes. During the past few years, prehistoric objects, bearing so striking a resemblance to

them as to suggest at once that they have some relation to Churinga, have been unearthed in Europe. It is of course possible that these latter may have been of the same nature as the Australian Churinga, but in the absence of direct evidence it is far from safe to assert positively that such is the case. There can be no doubt however, that objects of the Churinga, or bull-roarer, type were at one time widely associated with sacred ceremonies and beliefs. Possibly even the bull-roarers which are now playthings for children in Europe are surviving relics of a far past time when children were the very last who would be allowed to see and use them. In the normal condition of an Australian tribe a woman or child, seeing a Churinga, even accidentally, would at least be punished by having one or both eyes blinded with a fire-stick, and if a woman deliberately tried to pry into any of the sacred matters she would meet with very short shrift. As a matter of fact the women are far too frightened to attempt any such thing. They are not allowed to go anywhere near the spot where the Churinga are safely hidden out of sight.

At the present day the centre of the continent, occupied by the Arunta nation, is the great home of the Churinga and of all the many beliefs which cluster round this sacred object.

The word Churinga is used both as a substantive and as a qualifying term. Anything associated with the totemic ancestors, a shield or boomerang or stone knife, for example, which any one of them carried about, is spoken of, not as a Churinga, but as being Churinga, that is sacred. The stone or wooden slabs are Churinga, and so is the spot at which they are hidden.

Endless are the ceremonies associated with the Alcheringa ancestors and now performed by their

descendants. At Charlotte Waters we saw many of them, and here we had our first experience with the cinematograph. It is not a very easy matter to use this amongst savages. As they move about, you never know exactly where they will be, and you are liable to go on grinding away at the handle, turning the film through at the rate of perhaps fifty feet per minute, and securing nothing but a rapid succession of views of intensely uninteresting scenery and no ceremony. Each ceremony is called a Quabara, a word which at first suggests the common name corrobboree, given all over Australia to the ordinary dance in which men, women and children may take part. In the Arunta tribe this is called Altherta, but it is quite possible that there is some relation between the words Quabara and corrobboree, or whatever may have been the original word for which the latter is the English rendering.

While we were at Charlotte Waters ceremonies for the production of rain were in full swing. One of these was concerned with two men named Irria and Inungamella. In the Alcheringa the latter came down from the north to visit Irria, who was a great rain-maker, with the idea of persuading him to go north, where they were sorely in need of water. Irria however declined to go, and Inungamella started off home. After he had gone some distance he sat down to rest behind a sand-hill ; and then Irria began to make rain, wearing bunches of the red-barred tail feathers of the black cockatoo in his hair, because in the Alcheringa this bird brought the rain.[1] Very soon the rain fell, and Inungamella came back to see what Irria had been doing. The latter took lumps of gypsum out of his stomach and gave them to Inungamella, telling him

[1] At the present day the harsh cry of the black cockatoo is a welcome sound amongst the Ranges in Central Australia, as it is a good indication of the presence of a waterhole.

Fig. 86. RAIN CEREMONY.
The performer's body is decorated with gypsum and in his hands he holds cockatoo feathers.

Fig. 87. THE "PINCH" AT OORAMINNA (p. 222).

that they were clouds and that by their means he could always get rain when he wanted to. Inungamella then went to his home in the eastern Macdonnells, which is now a great rain-making country, and buried the gypsum in the ground, using it to paint his body with when he performed (Fig. 86).

In another rain ceremony the natives used seven large slabs of wood, each of them between four and five feet long, which, after being well red-ochred, were decorated with lines and circles of white pipe-clay. One slab was fixed upright in a curious kind of helmet on the head of each performer. The helmets were similar to those very often used during corrobborees, and were made of a number of wiry twigs from one to two feet in length arranged so as to form a kind of fool's cap, slanting slightly backwards and firmly attached to the head by yards upon yards of human hair string which was wound round and round them. This done, a design in bird's down was added, human blood being used as gum, and finally the lower end of each slab was fixed, as firmly as possible, into the helmet thus made. Especially when a wind happened to be blowing, they were rather apt to sway about ; but it was astonishing how, with such unwieldy things on their heads, the men danced and pranced about to the accompaniment of a song, chanted by the audience, the members of which beat time on the ground with boomerangs and clubs. Under cover of night-time, as they might not be seen by the women or children, the decorated slabs and the helmets were brought into the telegraph station and fortunately reached the National Museum in Melbourne, where they are now preserved, without any serious damage.

In one of these rain songs there was a very good example of sympathetic magic. The natives have no

idea of cause and effect. They notice that two things occur one after the other, and at once jump to the conclusion that one is the cause and the other the effect. In Central Australia the cry of the plover is frequently heard just before rain falls. Therefore, argues the native, the rain is the effect and the plover-call the cause. Further, he argues, if I perform a magic ceremony and imitate the plover, then the rain must fall ; and so, in one of the rain songs, we continually heard the characteristic cry of the pil-pilpa, or plover, imitated with wonderful accuracy. Sometimes the ceremonies are successful, sometimes they are not, and of course they are always performed at the time of the year when it is usual for rain to fall. If it does come, then all is well ; if not, the natives attribute the failure to the influence of counter magic, stronger than their own, used by some enemy.

This rain ceremony is one of a series of very important ones to which the name of Intichiuma is given. Every totem group has its head man, and the members of the group are responsible for the increase of the animal or plant from which in the far past times they are supposed to have been evolved. Kangaroo men must keep up the supply of kangaroos, witchetty grub men that of witchetty grubs, grass seed men that of grass seed, and so on right through the totems. Along with this regulation is another—that you must not eat, or at most only very sparingly, your own totem. If you are a kangaroo man then you must not eat kangaroo ; but you may eat the animals that other men produce for your benefit, so that it is the same for everybody, except that a man whose totem is a fly or a stone has the advantage of one whose totem is a kangaroo or emu. There are times of the year when the head man of the totem calls the members of the local group together and performs

the Intichiuma ceremony. When the animal or plant becomes plentiful, supplies are brought in and placed before him. He solemnly eats a little, which must be done or he would be unable to perform the ceremony successfully, and then gives all the rest to the men who do not belong to the totem, telling them that he has made it for them, and that they may eat it freely.[1]

[1] These ceremonies, which are of great importance, are dealt with at length in *Native Tribes of Central Australia*, pp. 167–211, and in *Northern Tribes of Central Australia*, pp. 283–319.

CHAPTER IX

ALICE SPRINGS AND THE ARUNTA

On the Horn Expedition we had left the main track coming up from the south, and, after travelling westwards, crossed the Macdonnell Ranges and came in to Alice Springs from the north. As a general rule the track that follows the telegraph line is taken. Along this route, the Cretaceous plain ends abruptly at the foot of the Ooraminna Range, which rises somewhat abruptly, running east and west. In order to make a track, by which horses and camels can enter the Range, a rough kind of road has been blasted in the rocks at one particular spot, forming what is known as "the Pinch," and it deserves its name much better than the photograph shows. In reality, it forms a kind of, more or less smooth, rock ladder up which the horses stumble as best they can (Fig. 87).

On one of our journeys, after successfully passing "the Pinch," we followed the track for about eight miles, winding in and out amongst the rocky hills, and then turned back into the Ranges on the north side, so as to reach a rocky water-pool called by the natives Ooraminna (Fig. 88). The night before we had camped away from water and it was as much as we could do to unpack and unsaddle the horses, who evidently smelt the water, though we were camped at the entrance to a small rocky

Fig. 88. OORAMINNA WATER-POOL.

Fig. 89. DISTANT VIEW OF THE MACDONNELI RANGES, SHOWING ONE OF THE CHARACTERISTIC GAPS.

defile a quarter of a mile away from it. The water-pool is right in amongst the rocks ; indeed it is partly overhung by them and is thus sheltered from the sun. In ordinary seasons this can be relied upon, but in drought it is not permanent, and then there is a long, waterless stage of fifty miles between Alice Springs and the nearest waterhole on the south. In 1907, for example, it was quite dry. While we were camped there in 1901, a family of Alice Springs natives came in, including four piccaninnies, the youngest of whom was minute enough to be carried about by its mother in a pitchi—the usual way of carrying a young baby. The family had been out in the bush collecting food and the women were carrying large pitchis full of grass seed, and, having procured as much as they wanted, they were coming in to camp at the water-pool.

Early next morning we started away and, after traversing a low range, came out on to a wide open plain, the eastern continuation of the Missionary Plains. Ten or twelve miles ahead of us we could see the Macdonnells rising, and the narrow cleft in their midst towards which the track was streaking (Fig. 89). The last time that we had crossed this plain was in September 1896. Then, after a dry, weary ride of twelve days in the mail buggy, one of us—the solitary passenger from Oodnadatta—had entered the defile at Ooraminna after midnight. In those days the track was a lonely one, and for relays of horses the mailman had to rely on natives who, in return for "tucker" and tobacco, "shepherded" the horses, or did their best to do so, bringing them in to certain spots on the track at intervals of so many days, indicated by notches cut on a stick. The country in this southern part was dry and there was little water about, so that the horses had wandered far and wide, with the result that we

had few relays waiting for us. The mail man was what is called "a great man with the whip," and thought nothing of putting in one or two unbroken, or at most very incompletely broken-in colts ; and we well remember the morning on which we started from Crown Point, where the monotonous journey had been most pleasantly broken by a few hours' spell at the lonely little cattle station, since deserted, but then occupied by Mr. and Mrs. A. Ross. The horses were decidedly fresh, and at least one of them had never been in harness before. We harnessed up on a slight slope amongst the gum trees bordering the bank of the River Finke. As soon as we were seated, and the black boys, who held the leaders' heads, were told to let go, the whip cracked and immediately there was a scene of wild confusion. The leaders turned round so as to face the shaft horses and plunged and reared until it was a marvel that the whole harness did not fall to bits. However, only two or three traces and odd bits gave way, and, after these were mended, we essayed another start with much the same result.

Nothing whatever disconcerted, the driver, simply by a masterly use of the whip, at last started the team. First of all we went round in a circle, performing wonderful feats in the way of missing the gum trees, and then off we went at full gallop through the scrub, heading towards the river bank. The mailman advised the passenger to hold on, which he was already trying hard to do, for the bumping was phenomenal. As we came near the river bank, crashing through the smaller scrub and dodging the trees, we saw that there was a sudden jump of three or four feet straight down into the river bed. How the horses managed the jump in safety we do not know, but the whip cracked, first to one side and then to the other, picking out effective spots with unerr-

ing accuracy, and before we well knew what had happened, the trap had gone down plump into the soft sand. Before the horses had time to realise where they were, the whip was again cracking and they were hard at work ploughing through the river bed, dragging the buggy across. By the time that they had climbed the opposite bank they probably realised that a master whip was behind them and, except every now and then, they went on quietly enough. All the day before reaching Ooraminna we had toiled along slowly, for the horses were dead-beat—one of them had been in the buggy for more than two hundred miles—and, as darkness came on, we simply crawled along. Hour after hour passed by, and the track, but a very poor one at the best of times, grew more and more indistinct. The only thing to do was for the mail man to walk ahead and for the other to follow with the buggy, watching where he went. Amongst the hills the darkness was intense, but we knew that we could not be far from Ooraminna, and a little after midnight, to our delight, we saw ahead of us the light of a camp fire, the size of which showed that it belonged to a white man, and the solitary passenger felt sure that his old friend had come out to meet him. Very soon we were comfortably settled in camp, and the rest of that night was spent discussing our plans and future work among the natives. We drove on next day across the plains, which were dotted over with large red kangaroos. There were scores of them feeding quietly, and as we drove along, they stood up on their hind legs, gazed complacently at us and then hopped away across the level plain. This was in 1896, but now, in 1901, there was clear evidence of the succession of bad seasons from which the country had suffered. Even the cassia bushes, and the equally hardy Hakeas, were shrivelled

and many of them dead, and not a trace of a kangaroo was to be seen. Once more we travelled on to the foot of the Ranges until we reached the Heavitree Gap, through which the Todd river passes out southwards from the hills (Fig. 90). The Gap is at most one hundred yards wide and not more than two hundred from north to south, and on each side of it the red rocks rise precipitously for several hundred feet. It forms, in this part of the country, the only way of passing through the Ranges. The river bed fills it completely from side to side, and when it is flooded, which very rarely happens and then only lasts for perhaps a few hours, it is impassable. Red gums grow on the sand and a few cycads are dotted about on its precipitous walls. It cuts through the Range which bounds the Horn Valley on the north, the Range which forms the southern boundary of the valley being much less definite here than further to the west. A little to the west of the gorge, the ridge rises into a bold bluff, three thousand feet high, called Mt. Gillen, or in the native language Okniambanta—the great father—because, as seen from Alice Springs, it stands out and dominates the other hills immediately round about it, though, looking across the plains from the south, there is a much more imposing mass away to the east.

The Heavitree Gap is the only break in the Range for many miles, and, after passing through it, the track comes out on to a small flat on which has been built the little township of Stuart—called after the explorer, McDouall Stuart. In the early days this remote township consisted of two or three stores and the inevitable bush inn. Except in rare cases, it used to be, and probably still is, the northern terminus of the camel track, along which teams carried stores to the township, the telegraph station, outlying cattle-runs in the

Macdonnell Ranges, and, in more recent times, the Arltunga gold field. Under ordinary conditions the mail buggy, which in those days ran once in six weeks (now once every two weeks), occupied ten days in the journey from Oodnadatta. The traveller carried rugs and provisions, as there was only one small store *en route*, a kind of log hut, at a spot called Horse Shoe Bend, where the choice of provisions was naturally not great and the price inversely proportional. All cooking, if any were required, had to be done by the passenger himself, and the nights were spent lying on the ground in the open, just wherever the mail cart happened to come to a stop. On the last occasion on which one of us travelled with the mail man, lack of horses delayed us; we used to be up at daybreak and never camped till long after dark, and even then, as we could only crawl along at a snail's pace over the heavier parts of the track amongst the sand-hills, we were three days late.

The ordinary traveller who has a limited supply of horses, and more especially if he has considerable stores to carry, cannot travel at anything like the pace that the mail must. The last time we went through, it took us, apart from spells *en route*, just twenty-one days to reach Alice Springs from the head of the railway line.

On this occasion, as soon as we had passed through the Heavitree Gap we noticed a great change in the place. The red gums bordering the river were still there, though we missed one ancient tree with a great hole in its trunk which used to stand half-way between the Gap and the present township. In and out of it the Iruntarinia, or spirit individuals, used to pass on their way to and from the caves that they inhabited below ground, where they lived amongst plenteous supplies of food and ever-flowing streams of water. The smaller scrub of acacias, which

years before formed a thick growth back from the river, had disappeared, and the whole valley stretching between the hills was bare and open. Following the track towards the telegraph station, we passed the township and then went on for a mile or two beside the river Todd until we came to our old camping ground, on which we had spent three months in 1896 watching the natives perform the Engwura ceremony. The severe drought had completely exterminated all the low scrub, and now, instead of being completely sheltered from view, as it was when we last saw it, it was widely open. The change was so great that we could hardly realise that it was the same place, but, for the sake of old association, we once more pitched our camp on it.

On the Horn Expedition, in 1894, our time was too limited and too much occupied with travelling, for us to see as much as we could have wished of the natives, for, unless you can spend some time amongst them and get to know them, and they you, it is simply impossible to do more than see just a little of the outside of their life. As one of the results of the Horn Expedition, Dr. Stirling, the ethnologist of the party, was able to publish a very interesting account of certain features of the Arunta tribe, aided by information, photographs and various weapons and implements given to the expedition by one of us, and supplemented further by notes written by the latter dealing with certain special subjects.[1] The information which was thus obtained added much to our knowledge of the tribe, but, so far as the more sacred or secret matters were concerned, it was very evident that we were only on the threshold of our work and that further study would be well repaid. Thus it came about that, at a later period, we determined to continue

[1] *Cf.* Stirling, *Horn Expedition Report*, Part IV.

the investigations into the manners, customs and beliefs of the Australian aborigines which one of us had begun some years earlier. Fortunately for the carrying-on of the work which we wished to do, the latter had been living in the Centre for more than twenty years, and had gained the complete confidence of the Arunta tribe, both at Charlotte Waters and at Alice Springs, and was received amongst them as a fully-initiated member of the tribe. Thanks to his influence, both of us were admitted to the inner circles. Unless you are regarded as an initiated member, there is no chance of your learning much about the more sacred or secret beliefs of the tribe. When we were traversing the continent in 1901 and 1902, the fact that we were thus regarded as initiated members of the Arunta tribe was of the greatest help to us, serving as a passport from one tribe to another. Our first work[1] was published after an investigation, as careful and minute as possible, of the Arunta tribe ; our second[2] after a further study of this tribe so as both to revise our previous work and also to extend it amongst tribes living further to the north.

From now onwards the account will be concerned with our work at Alice Springs in the summer of 1895-1896, and with our subsequent expedition across the continent in 1901-1902. We left Oodnadatta in March 1901, and except for a few days spent with our friend Mr. P. M. Byrne at Charlotte Waters, to whom on more than one occasion we have been indebted for most generous help in many ways, we pushed straight through to Alice Springs. Before we set out the summer rains had fallen —in fact the country had previously been in such a state of drought that we had to wait for a rainfall before we could

[1] *The Native Tribes of Central Australia*, 1899.
[2] *The Northern Tribes of Central Australia*, 1904.

possibly make a start. As we intended to go right through to Port Darwin, though as events turned out we went eastwards to the Gulf of Carpentaria, we travelled with horses and not with camels. Months before we started we had sent up stores of material to the overland telegraph stations at Alice Springs, Barrow Creek, Tennant Creek and Powell Creek, which we had the great advantage, thanks to the courtesy of the South Australian officials, of being able to use as depots.

Our party numbered only three white men, our two selves and Mounted Trooper Chance, who was granted leave of absence for the purpose by the Government, and whom we had chosen out of many applicants to take charge of our horses and impedimenta and generally to supervise the work of the camp. As we wished to come into intimate relations with the natives we decided to travel with as small a party as possible. Trooper Chance had already had much experience of Central Australia, and his general resourcefulness, including even no mean capacity as a cook, together with his tact in dealing with natives, if necessity should arise, were well known to us. We could not have made a better choice.

Not only had we to provide for our own food *en route*, but we also had to carry enough to allow of trade with the natives. Our principal stores were of course the prime requisites, flour, tea, sugar, tinned meats, jams, desiccated vegetables and fruits, and tobacco. Of flour we had forty bags, each containing two hundred pounds; one hundred and fifty pounds of tea; seven hundred pounds of sugar and four hundred pounds of tobacco. We had some five hundred tins of meats of various kinds; one hundred and twenty tins of jam, and three hundred pounds of desiccated fruits and vegetables. In addition we had four hundred butcher knives and the same number each of hatchets and

pocket-knives, which we fear have materially aided in the superseding of the old stone knife, though, long before we went through to the north, the natives lost no chance of securing an iron tool of any kind. We also had pipes innumerable, together with a large supply of photographic material. Our photographic apparatus included a Goerz-Anschutz quarter-plate hand camera—a most excellent little instrument; a half-plate camera made especially strong to resist heat and hard usage, and fitted with a Goerz-Anschutz lens and focal plane shutter; and also a cinematograph with which to secure records of native dances and ceremonies. For this we had three thousand feet of film. Owing to the great heat and dryness of the atmosphere in the Central area the shrinkage in the wood of which the cinematograph was made caused some trouble, as it was very difficult to prevent the fine dust from filtering through into the box and settling on the film. However the results, in the circumstances, were sufficiently good to justify this, which was the first attempt ever made to obtain moving representations of the ceremonies and dances of Australian aborigines. By the kindness of the late Mr. J. Angas Johnson we were provided with a phonograph, and thus secured some interesting records of native songs—the first ever thus recorded in Australia. The cinematograph and phonograph we only took as far as Alice Springs, using them amongst natives to whom we were well known; also, in the case of the cinematograph, we were afraid to carry films undeveloped for a year, more especially as the last part of our journey would lie in the far north in a region of damp heat. For the ordinary cameras we used glass plates exclusively.

It was April when we settled down for a month's work at Alice Springs amongst our old friends the Arunta.

Early on the morning after our arrival a deputation of eight of the elder men, who had decorated themselves with bands of white pipe-clay, came into our camp to welcome us formally. It was a solemn ceremony, for the Australian savage is very particular in regard to matters of etiquette. First of all they squatted on the ground in silence. Then, after a short pause, the head man of the Alice Springs group told us that they were very glad to see us again—this needless to say had special reference to one of us whom they had known, much to their advantage, for twenty-five years—and that we were welcome to their country. We acknowledged their welcome with a present of tobacco and a sight of the stores of sugar, tobacco and knives which we had brought with us. They were quite ready to share in these at once, but we assured them that they were to be given in return for work actually done, and they went back to their camp with smiles on their faces.

The Arunta people are distributed over the country in a large number of local groups, each of which occupies a certain well-defined area and has its own head man who is known as the Alatunja. None of these groups are of any great size, but they are very numerous. Some of them only occupy one or two square miles of country; others, such as the Alice Springs group, are the recognised proprietors of more than a hundred square miles. At the same time the tribe as a whole is regarded as owning the whole extent of territory over which the groups are scattered, and any member of the tribe is at liberty to visit any part, though there are times when different local groups will be on unfriendly terms with one another. As a general rule, however, they are quite friendly, and where the Arunta come into contact, on the borderland of their territory, with other tribes, such as the Urabunna

Fig 90. HEAVITREE GAP, MACDONNELL RANGE (p. 226).

Fig. 91. MEMBERS OF A FAMILY OF ARUNTA NATIVES, SHOWING THE WURLEY, WEAPONS AND IMPLEMENTS USED IN DAILY LIFE.

and Luritja, in the south, and the Kaitish and Unmatjera in the north, they are on perfectly friendly terms with them.

Each local group has its favourite camping ground, but the movements of the natives are entirely dependent upon the nature of the season. When food and water are abundant they will be scattered far and wide over the country, though such times also are taken advantage of to celebrate special ceremonies which require the attendance of a large number of natives in one spot. This of course is only possible under favourable conditions, and, on the other hand, in times of drought their camping grounds will be limited by the water supply. At each camping ground every family has its own mia-mia, which is usually only a lean-to made of boughs, often cleverly constructed, so as to withstand a strong wind in winter and shield its owners from the heat of the sun in summer (Fig. 91). In front of it is the family fire where all the requisite cooking is done, though this does not entail much trouble, and within it smaller fires are lighted at night-time to warm the occupants, who coil their bodies around them. There are two different methods of making fire in the Central tribes. The Urabunna take two sticks, one of harder and one of softer wood. The former is held upright between the two palms of the hands and twirled round on the other, which is held firmly by the feet of the operator (Fig. 92). A notch is cut where the upright is going to be twirled on the horizontal stick, to allow of the smouldering red-hot powder, produced by the friction, slipping down into a little mass of tinder, usually dry grass, placed ready to receive it. As soon as it begins to smoulder the mass is gently blown, and an expert operator will produce fire within a minute. The whole apparatus is called makka-tira. The upright piece

is called wapuppa kupa, the child stick: the lower one, which is supposed to contain the fire, is wapuppa aluka, the mother stick, or sometimes makka aluka, the fire mother.

In the second method, adopted by the Arunta and other tribes, the friction is produced by rubbing a hard wood such as a spear-thrower on a soft wood such as a shield. The former in the Arunta is made from mulga and the latter out of the bean tree (Fig. 93). Sometimes instead of a shield a cleft stick is used, a stick of harder wood being rubbed rapidly across the cleft, in which dry tinder is placed.

The worldly possessions of the owners of the mia-mia are scattered about without any fear of their being appropriated, because, in his natural state, the savage is decidedly honest. For one thing, the footprint of any burglar who might attempt to appropriate anything in the absence of its owner would at once be recognised. Their property is of a very simple nature. Clothing, as we have said before, is conspicuous by its absence. Their weapons are simple and few in number. All told, they consist of a stone axe, a flaked stone knife, a spear-thrower, wooden spears and boomerangs. The women have digging sticks and sometimes fighting clubs as well, though often the former serve both purposes, and wooden bowls or troughs called pitchis. Nowadays the stone implements are very rarely seen; the ground stone axe is almost extinct everywhere throughout the Centre and entirely so amongst the Arunta. The iron axe or tomahawk has spread far and wide, even amongst tribes but little contaminated by contact with white men, and the steel is rapidly replacing the stone knife and chipped flint—indeed by this time it has probably completely done so amongst the Arunta. The spears used by the Arunta

Fig. 92. MAKING FIRE BY RUBBING ONE STICK ON ANOTHER.
The lower stick is of softer wood than the upper.

Fig. 93. MAKING FIRE BY RUBBING THE EDGE OF A SPEAR-THROWER ON A SHIELD.

are of two kinds. The commonest form has a long wooden shaft made of a single piece of light wood cut from a tree such as a Tecoma, or more often of two pieces, a longer and a shorter. In the one of which the terminal part is figured, the two pieces measure respectively 2 m. 90 cm. and 40 cm. (Fig. 94). The two are spliced together; resin is placed round the splicing and kangaroo tendon wound tightly round this. The terminal blade is

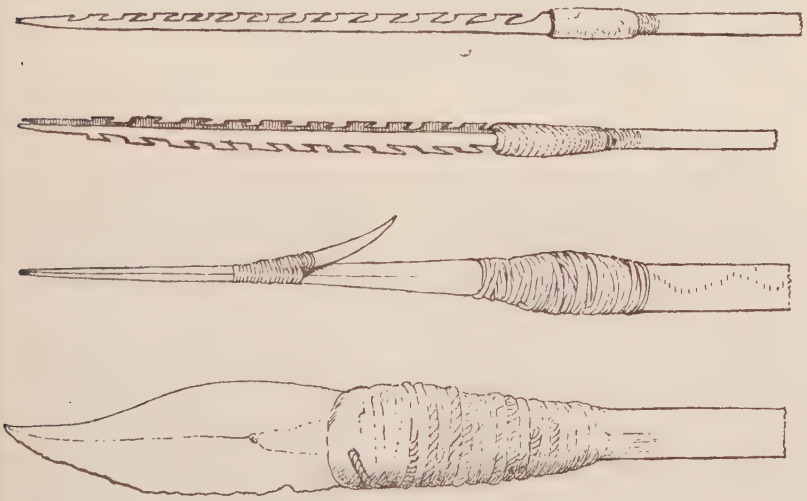


FIG. 94.—BARBED SPEARS. ARUNTA TRIBE.

always lanceolate in shape and made of a hard wood such as mulga. It is spliced as above described to the main shaft. The point is often drawn out finely, and a short distance from the tip a recurved barb is attached by tendon. The opposite extremity has a slight concavity for fixing on to the point of a spear-thrower. This spear is very characteristic of the tribes which inhabit the country in and about the Macdonnell Ranges and away south to Lake Eyre, and it is, curiously, one of the very few implements which are never red-ochred. It takes a good

deal of trouble to make, as the Tecoma shoots are usually much twisted, and needs to be very carefully straightened, bit by bit, by heating over a slow fire followed by pressure of the hands. Finally all excrescences are smoothed down with a flint. The second type takes even more trouble to make, though, when finished, it looks the simpler of the two. It is cut out of a single piece of wood such as an acacia or a "desert oak" and has a length of about 3 m.; the blade commences about 70 cm. from the point and is flattened, the rest of the shaft being circular in section. The natives say that they generally use the "desert oak" (*Casuarina Decaisneana*), cutting down a sapling and chipping away until it is the required size. This must be a slow process, and spears of this kind are relatively rare. They are always thrown directly by the hand, and consequently never have the slight concavity for the insertion of the knob of the spear-thrower. Of all his weapons the spear-thrower is probably the most useful one to the native (Fig. 95). It is roughly lanceolate in outline, or rather partly lanceolate and partly spatulate, tapering somewhat abruptly to a point at one end, where the knob for the insertion of the spear is attached, and more gradually at the handle end, where there is a blunt knob (Figs. 96, 97). The latter is made of a lump of porcupine-grass resin, completely enclosing the end of the wooden blade. It serves both to afford a good grip for the hand and to allow of the insertion of a stone chip which varies in size and shape to a considerable extent. It may be small and pointed, but more often has a single convex facet on one side, the other surface being finely chipped so as to produce a broad cutting edge. By means of this chipped flake of quartzite the native cuts through the tendons and flesh of the animals on which he feeds, smooths down his spear blades and spear-throwers, hollows out his

Fig. 96. SPEAR THROWING.

Fig. 97. SPEAR THROWING.

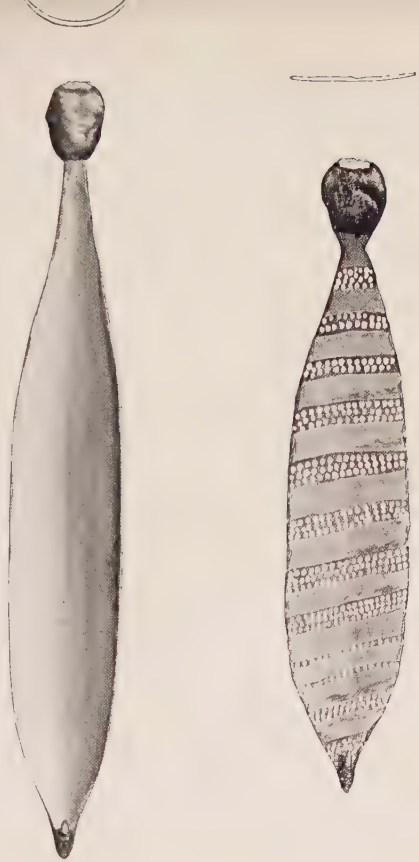


Fig. 95. TWO SPEAR-THROWERS, ARUNTA TRIBE. One of them is decorated for use during a ceremony.

pitchis, and marks the surface of these and of his boomerangs with the regular parallel flutings which are so characteristic of many of his implements and weapons. The blade of the spear-thrower is usually distinctly convex, but varies much in this respect and may sometimes be almost quite flat, like those used in West Australia, but it is never marked by the incised zig-zag designs that are almost always present on the latter. It is always made out of hard wood, such as that of an acacia, one special tree, the mulga (*A. aneura*), being most often used because it is most widely met with over the Central area.

A day or two after our arrival at Alice Springs in June 1901 the natives began one of their ordinary dancing corrobborees. The Arunta name for these is Altherta, and each one of them is continued night after night for one or two weeks. The first time you see one, when all is novel, it is well enough and decidedly interesting ; but after a week or two of repetition of the same, or almost the same, performance it has a tendency to become somewhat, indeed at times intensely, monotonous. However, the natives enjoy them, as they form their one social form of entertainment, and it gives the younger men the chance of appearing at their best before the women and children, who always form an admiring audience. The particular one which was performed on this occasion was called Tjitjingalla. It took place on a level plot of ground some distance away from the main camp, as no children, and only a very few women, were allowed near the ground while the preparations, which occupied the whole of every afternoon, were in progress. There is also another reason why the dancing ground should be some distance away from any ordinary camp. It is a fixed rule to desert any camping ground as soon as ever a death

occurs. The new camp is generally fairly close to the old one, or at least within easy walking distance, and it is therefore convenient to locate the common meeting ground, where corrobborees are performed, at a spot which need not be changed.

Except for variations in the decorations of the performers, all corrobborees are very much like one another. Early in the afternoon the men wended their way to the ground, sat down in groups, and, after a preliminary rest, began with much deliberation, for the native is never in a hurry, to make their very simple preparations. Each one carried a wallet which, in the natural state, is only a piece of kangaroo skin or Ti-tree bark tied round with opossum fur string and containing, apart from weapons, all the worldly goods of its owner. Under present conditions the wallet is as likely as not an old stocking or part of a discarded trouser leg. When the wallets were opened they were seen to contain balls of opossum or human-hair string, chiefly the latter, bits of gypsum, charcoal, red and yellow ochre, tassels made from the tail-tips of the rabbit bandicoot, bunches of feathers, odd chipped flakes, though these were not common, and, still more rarely, little Churinga carefully wrapped in anything that would serve to conceal them from the vulgar gaze. Needless to say these were not for use during such a ceremony as an ordinary dance. On the corrobboree ground there were flat grinding stones that are always left here—sometimes, when not in use or when the natives move away to another camping ground, they are buried out of sight. First of all some down, obtained from a Portulaca plant, each man possessing a little store of this requisite, was spread out on a grinding stone and then by means of a smaller stone held in the right hand was rubbed over and over with powdered gypsum or red

Fig. 98. PREPARATION FOR THE TJITJINGALLA CORROBBOREE, ARUNTA TRIBE.

ochre until it was white or red as the case might be. Some of the men went into the scrub close at hand, and gathered bundles of the stiff straight twigs from the cassia plants which grew all around. When the down was ready, one or two of the men, it did not matter who, tied some string tightly round the upper part of the arm and with a sharp flake of stone, or, better still, a chip of glass if they could get one, cut open a vein and allowed the blood to spurtle into the concavity of a spear-thrower or the hollow made to contain the hand in a shield. We noticed here and elsewhere that many of the men had the veins which stand out on the lower part of the arm marked with numerous little knot-like scars indicating where they had cut themselves during ceremonies of various kinds. When sufficient blood had been drawn the string was untied, a finger was pressed down on the cut for a short time and the bleeding soon ceased. Then the actual decoration of the performers began, helmets being made and designs drawn on the bodies of the men as we have already described. It would be tedious to describe the process in further detail; a better idea of the *modus operandi* and of the nature of the decorations can be obtained from the illustrations than from a verbal description (Fig. 98). The only thing that need be added is that each corrobboree has its own set of designs, though they are frequently very similar, and that each performance has also its own songs, chants or refrains, all of which are of a very simple and monotonous character and are repeated hour after hour, indeed sometimes day after day, with wearying monotony. By means of the phonograph we were able to get records of several of the songs. To the ordinary listener, and apart from the actual quality of the music, a characteristic and picturesque feature of the latter is the way in which

it begins on a high note and gradually falls lower and lower, at the same time fading away into silence. The effect is just the same as that of a number of people chanting, not unmelodiously, as they travel along until their voices are lost in the distance. Every now and then the sound increases slightly in intensity, just as if it were being carried back to you by a puff of wind.

The dancing itself was of a very simple nature. In this particular corrobboree there were about a dozen performers, though of course there is no fixed number. In some of the figures they merely moved in line, wheeling backwards and forwards in front of the audience, always with a very characteristic prancing and high knee-action. In others the men divided into two lots, passing across so as to face one another at a few yards' distance. Then they alternately approached and fell back in line, each party at intervals skipping across, the two lines opening out so that the men of one could pass between those of the other, much as if they were changing sides in a square dance (Figs. 99, 100). Sometimes each performer held in both hands a stave made out of a straight piece of wood—a small bough—about four feet long and covered with human-hair string. This was moved up and down in time to the dancing. On other occasions each man had a stick shaped something like a gigantic tuning-fork, held with both hands in such a way that the two prongs passed one on each side of the neck. At the close of every movement, each of which lasted from one to two minutes, seldom longer, the performers always retired for a short time into the darkness away from the light of the camp fires. There was always an interval in the middle of the evening when, at a signal given by an old man in the audience, the women and children rose and went away to one side of the ground so as to allow the men to have a rest and a quiet chat. We

Fig. 99. DANCE IN THE TJITJINGALLA CORROBBOREE, ARUNTA TRIBE.

also usually took advantage of this interval to retire to our camp, as after watching it every night for a week or two, the dance with its numberless figures, all of them closely alike, became decidedly monotonous. The natives never seemed to grow weary, however, and in our camp nearly a mile away we could, every now and then, hear the singing and the clanging of the boomerangs when the wind bore the sound towards us. The only really interesting part was the very end, when one man was especially decorated, not with the usual grass-seed but with birds' down, a most unusual proceeding in the case of these ordinary corrobborees which women and children may watch and at times even perform. The first part of the evening's performance was of the usual description, but after the interval the audience, consisting of about one hundred individuals, instead of sitting on the ground, stood beside a small wurley, shaped like a huge beehive. As it had been built at the beginning of the corrobboree, the leaves and twigs were quite dry. On this last evening there were fourteen performers, of whom twelve took part in the first half, the other two not being seen, though they were close by under the shelter of a low rise. After the interval the twelve ranged themselves, at first silently, in front of the wurley, looking out into the darkness as if they were expecting something to appear. There was very great excitement amongst the members of the audience, especially the women and children, who were frightened. After a few minutes' pause two figures were seen creeping down the low rise close at hand towards the wurley. Both of them crouched down low as they crept along peering about. The leader carried a shield which he held as if he were trying to hide the man behind from view. As they came into the light of the fires on the corrobboree ground it was seen that the latter was

elaborately decorated with close-set wavy lines of birds' down all over his face, head and the upper part of his body, and that he had a circlet of tufts of white and pink feathers, each attached to a short stick, all of them radiating from his helmet like the points of a great tiara. Suddenly he seemed to become aware of the group of performers standing between him and the wurley. He sprang forward holding with both hands a spear tipped with a bunch of feathers and charged full-tilt at the dancers as if to force his way through them to the wurley, which was, indeed, supposed to be his own dwelling. Amidst the loud shouting of the men and women, the latter gesticulating violently with their hands as if to ward him off, he charged and recharged the performers, who ran with a curious side-movement backwards and forwards in front of the wurley, yelling and prancing about wildly. The excitement on the part of the audience became greater and greater. Suddenly an old man came out from the crowd and set fire to a great heap of dry shrubs placed to one side. The decorated man then forced his way through the dancers, or rather they opened out for him to pass through, ranged themselves in line behind him and followed him as he danced wildly round and round (Fig. 101). This was the signal for the women and children to retire, which they did precipitately, the younger ones rather frightened as well as greatly excited. No sooner had they gone than, amidst the loud yells of the men and the clanging of boomerangs, the wurley was set on fire, the dancers stamping and jumping on it until it was one mass of flames which lighted up the thin scrub and the white trunks of the gum-trees and shone weirdly on the bodies of the men, who continued to dance madly. Gradually the fire died down until only a heap of glowing ashes remained. The outlines of the hills and trees and

Fig. 100. TJITJINGALLA CORROBBOREE (p. 240)

Fig. 101. FINAL DANCE IN THE TJITJINGALLA CORROBBOREE, ARUNTA TRIBE.

the bodies of the natives grew indistinct, and the corrobboree was over.

We were not at all sorry when it came to an end. The last evening was the only really interesting part of it; otherwise it was as monotonous as possible. The performance of this Tjitjingalla corrobboree by the Arunta is a good example of the well-known way in which corrobborees of this kind are handed on from group to group and even tribe to tribe. As soon as it began, we recognised at once that it was closely similar to the one which Roth described in 1897 as performed by the natives of Boulia in Queensland under the name of Molonga. Apart from the facts that the name was changed, that the time occupied in the Arunta performance was more than double that in the one at Boulia, and that the closing scene was much more elaborate than the one described by Roth (the natives of Boulia being very much more civilised than the Arunta people were when we saw it performed) the dance, as enacted at Boulia and in the Macdonnell Ranges, was closely similar. This same corrobboree, or rather a very small fragment of it in much mutilated form, was seen by Dr. Gregory at the Peak Station near Warrina a few months later than the time at which we saw it at Alice Springs. Dr. Gregory applies the same name to it that we had used in describing it as occurring in the Arunta, and gives an interesting map showing its line of transmission, as indicated by Roth and the Lutheran missionaries, along the country to the east of Lake Eyre.[1] That the same name, different entirely from the one applied to it, presumably, at its birthplace, should be given to it at Alice Springs on the one hand and, on the other, at the southernmost point of its easterly route of travel, where it was seen by Dr. Gregory,

[1] *The Dead Heart of Australia*, pp. 209 *et seq.*

is somewhat remarkable. Beyond the fact that it originated somewhere in the far north—possibly, as Roth suggested, in the Worgaia tribe, though there is no proof of this—we know nothing definite of its origin; but it is interesting to see that it has travelled southwards, as all traditions, customs, and ceremonies do in Central Australia, and also that it has travelled along two distinct routes, through tribes belonging to distinct nations, one route leading to the east and the other to the west of Lake Eyre. This fits in well, and is probably closely associated, with the lines of migration of the Central Australian tribes along two main routes as originally suggested by us.[1]

One very natural result of the handing on of these corrobborees from one part of the continent to another is that, after a very short time, the words of the song cease to have any meaning to the performers. The words themselves doubtless undergo change, though it is surprising how accurate the natives are in remembering and imitating decorative designs; how far this applies to the words of the refrains it is difficult to say. It is, however, much more likely that the sounds should change rather than the designs, which remain wonderfully constant. When, as we have pointed out more than once, a party of natives from some distant locality, either within the area occupied by the one tribe or from outside, is visiting a local group, it is customary to show them some special mark of attention, and this often takes the form of enacting some corrobboree, which is then made a present to the visitors, who carry it back with them to their own country. When this has been done the donors cease to have any proprietary interest in that particular corrobboree—they

[1] This was suggested for the first time in *Native Tribes of Central Australia*, p. 113.

have given it to their friends and never, in the normal condition of the tribe, perform it again.

There are various kinds of corrobborees. Some of them appear to be simply dances without any special meaning, though quite possibly they may once have had one which has been lost. The only thing which we could find out about the Tjitjingalla was that the last scene was supposed to represent the actions of a party of men who were anxious to persuade one special man, celebrated for his wisdom and strength, to join them. The bush wurley was supposed to belong to him, and the idea was that they had got between the old man and his camp while he was away out in the bush and that when he came back again they tried to prevent him from going into his wurley, and finally succeeded in persuading him to join them and to place himself at their head. This, however, may be nothing more than a meaning now attached by the Arunta to a performance which was originally intended to represent something quite different. At the same time the explanation fits in well with the acting, though this is by no means conclusive evidence in favour of its truth. Roth, on the other hand, gives the explanation of the Boulia natives as follows,[1] though this again is no more likely to be correct than the one above. He says the Molonga—that is the central figure—"is invisible to ordinary mortals, unless it be to the 'doctors,' and in general appearance is believed to be something like the central figure in the fifth night's performance. When on his depredatory excursions, on the warpath etc., Molonga is said to tie up the toes on each foot and hitch them up with string to their respective knees: another string is similarly fixed to each heel and attached to the back of the knee in corresponding fashion. The object

[1] *Ethnological Studies*, p. 121.

of this tying up is to necessitate the gentleman's walking only on the under surface of the instep, with a view to obliterating all the tracks. . . . Supposing the performance of this particular corrobboree were not to be properly executed, Molonga would revenge himself, etc."

In addition to the usual corrobborees such as the Tjitjingalla, which is a very good example of this type, there are others which are of a different nature and illustrate the actions, for example, of birds and beasts. These are the inventions of special individuals and represent with wonderful suggestiveness the movements and behaviour of the animals to which they refer—eagle-hawks hovering over their prey or swooping down on their great nests ; or perhaps a native dog pursuing its quarry ; and, since the advent of the white man, the action of bullocks or the last moments of a camp dog that has taken a poison bait. There is no mistaking what these performances are meant to indicate, and they show the wonderfully accurate observation of the native no less than his power of mimicry, which is often not only marvellous but intensely humorous. Performances such as these depend entirely for their popularity on the capacity of the individual performer or performers, and are quite distinct from what we may describe as the set pieces, such as the Tjitjingalla.

It is astonishing how much time is occupied by the natives in the performance of corrobborees; in fact, amongst the Arunta, they seemed to be continually being performed, one after another, except at such time as the men were engaged in other ceremonies which took them away, often day and night, from the main camp and the corroborree ground. Under ordinary conditions their life is a simple one, and granted a good season, it is not by any means a really hard one, though seasons of plenty

are more than made up for by seasons of drought, when they have to work hard for their living.

Life in an Arunta camp is monotonous to a degree, and very uneventful. The men are either lounging about, lazily mending old, or making new weapons, only going out in search of larger animals such as kangaroos or emus when hunger prompts them to secure something more substantial, or at least more bulky, than the smaller animals—lizards, rats, snakes, frogs, etc.—which the women and children collect and bring into camp, together with supplies of grass-seed, which is ground up and made into very rough, and very hard, flat cakes. Apart from ceremonies and dances, the one great break in the monotony of life is paying visits to strange camps. Packing up is not a tedious process; the man simply walks out of camp, carrying his spears, spear-thrower, boomerangs and shield; the woman takes the youngest child across her hip, balances a pitchi on her head, and with one arm round the child and a digging stick in her free hand, she is ready for the road. The girl children and younger women look after the puppies, which are never left behind on any account, and, when unable to walk, are carried in pitchis like young babies. Two minutes at most is all the time required for an aboriginal family to pack up and start, and there is no trouble in regard to the house while the owners are away. If any one chooses to occupy it during their absence he can do so, but the owners will see at a glance who has been in possession while they have been away.

Sometimes men, women and children travel together, sometimes men only—all depends upon where they are going and what they are going to do. If it be to attend an important ceremony, then the whole camp will go; and this of course means that they move slowly, though the

native is very rarely in a hurry unless he wants to get out of the way of some special party or person who is in search of him, and then he can travel with remarkable speed. As they are travelling along they have to provide themselves with food, but under ordinary conditions this is not difficult, and, if they come to a good locality for food and water, they just camp there until they feel inclined to move on, or until they think it is time to do so if they have to be present at some special ceremony. They have to be very careful to attend to certain points of etiquette on approaching a strange camp or on coming into the country of another local group: otherwise they might be received and greeted as enemies. Of course the very fact that a party is travelling with women and children is *prima facie* evidence that their intentions are not hostile, but a party of men travelling without any of their womenfolk is always looked upon with suspicion. In all cases the coming in of strange natives is associated with some amount of ceremony. One afternoon at Alice Springs there was a sudden commotion while we were in the camp—due, as we soon found out, to the fact that word had been brought in that a party of armed strangers was approaching. Every man, and woman also, was at once on the alert. The visitors, as usual, sat down quietly about half a mile away from the main camp. There were some thirty of them, all full-grown men and all armed with shields, spears and boomerangs and wearing in their hair curious flaked sticks called inkulta. We were decidedly curious to see what would happen, for, especially in the northern part of the Arunta tribe, the wearing of these sticks is the sign that the men mean to kill some one if they can. For example, men going on an avenging expedition wear them, and when they have killed their victim, tear them from their heads, break

Fig. 102. WELCOMING DANCE, ARUNTA TRIBE.

them in bits and throw them on the dead body. After about half an hour, during which time no notice had apparently been taken of the visitors, though, in reality, the local men had provided themselves with their weapons and gone to the spot where visitors were received, one or two of the older local men went to them, squatted down on the sand in front of them, and invited them to come up. After being thus invited they formed themselves into a solid square and approached at a fairly quick run, every man with his spear aloft and all of them adopting the curious high knee-action which is so characteristic of the movements of the natives during ceremonial performances (Fig. 102). As they came near a small defile leading to an open patch of ground, they were met by some of the older women of the local group, whose extraordinary antics, as they danced and yelled at the top of their voices, were ludicrous in the extreme. But no one seemed to pay the slightest attention to them; the visitors scarcely took any notice of them, and it proved to be all part of a well-understood method of procedure—it was only a kind of preliminary welcome to men who belonged, in some cases, to the same part of the country as did the women who were thus vociferously greeting them. At the same time three men, each armed with a spear, shield and boomerang, appeared on the top of the hill close by, their bodies sharply silhouetted against the sky, gesticulating wildly, as if to show the visitors that they were quite prepared to fight if necessity arose. All of this however was mostly make-believe, for it pleases the savage to persuade himself that he is a good deal more valiant than he really is. As soon as they had passed through the small gap leading on to the ceremonial ground, they were joined by a number of the local men, all carrying arms; and then, forming in a column four

deep, and led by the chief man amongst the visitors, they all ran round and round with spears aloft and high knee-action. When this little reception dance was over, the two parties separated; the local people retired to the rocks on the hillside close by, while the visitors squatted on the level ground. For a few minutes nothing was done or said, and all this time the local people, men, women and even children, were gathering on the ceremonial ground. Then without a word the leader of the visitors went round his party, collected all the flaked sticks from their heads—every man had two and some three and four—and solemnly presented them to the head man of the local group. This was as a sign that the visit was meant to be purely a friendly one. The head man made a fire and at once burnt them—an annoying waste of good ethnological specimens, as they take a long time to make, but of course we did not dream of interfering with them (Fig. 103).

After this things began to get, if not more interesting, at least decidedly more lively, indeed at times rather exciting. However friendly two parties of natives, belonging to different localities, may intend to be when they meet one another, the chances are strongly in favour of a disturbance of some kind arising amongst, at all events, the younger men, who, with the moral courage that comes from the knowledge that they have plenty of friends around them, are bound to be more or less aggressive; so, knowing something of the native character, we waited quietly, watching for any interesting development that might occur. We had not long to wait, and when once the ball was set rolling, we had plenty to look at and think about for the next two or three hours. It was more than three of the younger men could stand, to see, sitting quietly in front of them, a guest who, in their

Fig. 103. BURNING THE FLAKED STICKS.
They have been made into a bundle together with dry grass stalks.
The smoke is seen on the left side.

Fig. 104. MEN CUTTING SHOULDERS IN TOKEN OF MOURNING, ARUNTA TRIBE.

opinion, had not mourned properly when death had robbed him recently of one of his numerous fathers-in-law. It was not what we should call his real father-in-law who had caused the trouble, but it was a man who was the father of a woman whom the delinquent might legally have married. That he had not done so made not the slightest difference to the question of right and wrong. Three of the aggrieved sons-in-law suddenly jumped up from the rock on which they were sitting, pranced down the flat, taunting their visitor as an arrant coward who was afraid to do his duty, and ended up without any warning by hurling their boomerangs at him. This was more than he, in his turn, could stand. He warded the weapons off easily, but that was not enough to show that he was no coward, so he first of all retaliated by throwing his own boomerang and then pranced down the flat to where his accusers stood. He embraced the oldest of the three, and then they two sat down together on the ground with their arms round one another, some of the other men coming up to watch the performance (Fig. 104). The accused man loudly expressed his determination to cut himself on the shoulder, right through to the bone, while the other man, instead of taunting him further, or aiding and supporting him in his repeatedly expressed determination to do himself some serious damage, tried to soothe him and begged him not to injure himself too much. This did not appear to be a very difficult matter, but it occupied a good deal of time. The final result was that he slightly cut his shoulder with a stone knife, and thereby completely re-established friendly relationships between himself and his accusers. The same performance was gone through in the case of two other men and then there was a pause, every one waiting to see what would happen next, and no one, so far as we could see, anxious to enter into pefectly friendly relations straight

away. Again we had not long to wait, for suddenly an idea struck one of the local men, who jumped up, accused a visitor of having killed his brother some years previously, and challenged him to fight. The accused was probably as innocent of the crime as we were, but of course he had to accept the challenge, or be branded as a coward, and, at the same time, in the eyes of the natives, confess by his silence that he was guilty ; so of course he pranced about denying the charge and daring his accuser to fight. The latter, as challenger, had the right to assume the offensive, and in rapid succession he hurled three boomerangs, one after the other, at his enemy, who protected himself as best he could with a shield. The first two he warded off but was not quite quick enough to avoid the third, or rather he did not hold his shield at the right angle to make it glide off harmlessly. The result was that his shield was smashed and he received a nasty wound in his arm, after which the old men interfered and stopped the fight. Then there followed more charges and more boomerang throwing, but no one was hurt. A slight pause gave time to conjure up other real or pretended wrongs, and a local man accused one of the visitors of having been the cause of his wife's death more than a year ago. This created a great hubbub, and at once there was a rush on the part of all present, men and women alike, to where the accuser stood, prancing about, yelling and brandishing his spear as if he would throw it on the slightest provocation (Fig. 105). Accusations of all kinds were bandied about from one individual to another until there was probably not a single man, visitor or host, who had not been accused of doing something which he ought not to have done. Then the women took a hand in the affair, and for half an hour they pranced about until at length, apparently for no special reason, except that everyone

Fig. 105. WELCOMING CEREMONIES. BEGINNING OF A QUARREL. ARUNTA TRIBE.

seemed to have said all that could be said on the matter, the disturbance suddenly fizzled out. Almost before there was time for quiet to be restored, the man who had made the last accusation, and had evidently worked himself up into a very aggressive frame of mind, turned round and levelled a charge against some of his own party. He was a Bulthara man, and he accused some of the Purula men of not having paid sufficient respect to the memory of one of their fathers-in-law. Instead of having left the camp and stayed away until, as he put it, the green grass had grown on the grave—how long this would take would depend entirely upon the nature of the season—they had only stayed away for a very short time. Apparently this was a serious matter; at all events it was the sign for a general tumult. The din was indescribable. Men turned on one another gesticulating wildly and threatening each other with spear and boomerang, while, regardless of the imminent danger of having their heads cut open by a blow from a boomerang intended for someone else, their women relatives intervened, prancing around their friends and yelling at the top of their voices. In vain did some of the older men try to quieten matters down. No sooner would one interfere, or attempt to do so, than some one would level an accusation against him, and in a moment he would be up in arms ready to defend himself or assault all and sundry. No one seemed to have the slightest control over his or her feelings, and as all the men were fully armed, and were constantly in the very act, apparently, of throwing their spears or boomerangs, it seemed simply impossible to avoid a serious fight; and yet, despite provocation such as would have made the mildest mannered and most ardent peace-at-any-price member of a white community feel compelled to vindicate his honour, not a blow was

struck. This last quarrel led, however, to one interesting result. It divided the combatants into two groups, quite irrespective of whether they were visitors or hosts. The Panunga and Bulthara men on the one hand, and the Purula and Kumara men on the other, made common cause, and as soon as the tumult had subsided, the two parties thus formed left the field and went to their respective camping grounds. The next day relations were still somewhat strained, but after that everything was perfectly friendly; all signs of temporary disagreement had disappeared and the camp life pursued its normal course.

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